2019-2020 Academic Catalogue

Correspondence

For prompt attention it is suggested that correspondence or calls be directed as follows: **Area code for all numbers is 540**

Academic Policy—Dean of the Faculty 464-7212
Academic Records—The Registrar 464-7213
Admissions—Director of Admissions ..... 464-7211 or Toll Free 1-800-767-4207 (Admissions related calls only)
Affirmative Action—AA/EEO Officer 464-7322
Alumni Affairs—Senior Executive Vice-President, VMI Alumni Association 464-7221
Bookstore—Keydet Bookstore 464-7637
Business Matters, Construction, Maintenance—Deputy Superintendent (Finance Administration and Support) 464-7321
Calendar—Office of the Chief of Staff 464-7104
Commandant—Commandant's Office 464-7313
Contacting Cadets—VMI Visitor Center 464-7306
Financial Aid—Financial Aid Officer 464-7208
Financial Matters—Student Accounting (Tuition, Room/Board, Fees) 464-7217
Foundation—Executive Vice-President, The VMI Foundation, Inc. 464-7287
General Policy, Emergency Absences, and Discipline—The Commandant 464-7313
Health of Cadets—Institute Physician 464-7218
Intercollegiate Athletics—Director of Intercollegiate Athletics 464-7251
Intercollegiate Athletic Tickets—Ticket Office 464-7266
International Programs—Director of International Programs 464-7421
Miller Academic Center (MAC)—Director 464-7661
Parents Council—Parents Council Liaison 464-7072
Parents Weekend, and Related Matters—Office of the Chief of Staff 464-7104
Public Information and News—Communications and Marketing 464-7207
Robert A. Marr School of Continuing Engineering Education (records)—Registrar's Office 464-7213
Sports Information and News—Intercollegiate Athletic Communications 464-7253
Summer School/Summer Transition—Director of the Summer Session 464-7319
Student Accounting—Director 464-7217
Title IX Coordinator—Inspector General 464-7072
VMI Research Laboratories—Director 464-7247
Vocational Placement of Cadets and Graduates—Director of Career Services 464-7560

For more information on attending VMI visit: *www.vmi.edu* or call 1-800-767-4207

Non-discrimination Statement

The Virginia Military Institute is committed to providing an environment that emphasizes the dignity and worth of every member of its community and that is free from harassment and discrimination based on race, sex, color, national origin, religion, age, veteran status, sexual orientation, pregnancy, genetic information, against otherwise qualified persons with disabilities, or based on any other status protected by law. In pursuit of this goal, any question of impermissible discrimination on these bases will be addressed with efficiency and energy and in accordance with VMI General Order 16. General Order 16 also addresses complaints or reports of retaliation against those who have opposed prohibited practices, those who have filed complaints or reports of prohibited practices, and those who have testified or otherwise participated in enforcement of General Order 16. Questions regarding discrimination prohibited by Title IX of the Education Amendments of 1972, or other federal law, may be referred to the VMI Inspector General and Title IX Coordinator, 212 Carroll Hall, VMI, Lexington, VA 24450, (540) 464-7072. Any cadet or prospective cadet having questions about disability services for students should contact the Director of the Center for Cadet Counseling and Disability Services, 448 Institute Hill, 2nd floor, Post Infirmary, Lexington, Va. 24450, (540) 464-7667. For employment-related disability services, contact the Americans with Disabilities Act Coordinator in the VMI Human Resources Office, Lexington, VA 24450, (540) 464-7322.

The Mission

The Virginia Military Institute believes that the measure of a college lies in the quality and performance of its graduates and their contributions to society.

Therefore, it is the mission of the Virginia Military Institute to produce educated and honorable men and women, prepared for the varied work of civil life, imbued with love of learning, confident in the functions and attitudes of leadership, possessing a high sense of public service, advocates of the American Democracy and free enterprise system, and ready as citizen-soldiers to defend their country in time of national peril.

To accomplish this result, the Virginia Military Institute shall provide qualified young men and women an undergraduate education of the highest quality—embracing engineering, science, and the arts—conducted in, and facilitated by, the unique VMI system of military discipline.

Institute Calendar 2019-2020

Critical Dates and Academic Calendar

First Semester—2019

New Cadets matriculate (Cameron Hall)	Sat, 17 Aug
Old Corps returns	Sun (2200), 25 Aug
Registration	Mon, 26 Aug
Classes begin	Tue, 27 Aug
Last day for curriculum and course changes	Tue, 3 Sep
1st Fall Reunion Weekend	Fri-Sat, 20-21 Sep
Reunion Weekend	Fri-Sat, 27-28 Sep
Parents Weekend	Fri-Sun, 11-13 Oct
Fall FTX	Fri (CAD)-Sun, 25-27 Oct
2nd Fall Reunion Weekend	Fri-Sat, 1-2 Nov
Homecoming Weekend	Fri-Sat, 1-2 Nov
Founders Day (No classes)	Mon, 11 Nov
Ring Figure	Fri, 22 Nov
Thanksgiving Furlough	Sat (CMD)-Mon (2200), 23 Nov-2 Dec
Classes end	Wed, 11 Dec
Reading Day	Thur, 12 Dec
Exams	Fri-Wed, 13-18 Dec
December Joint Commissioning Ceremony	Tue, 17 Dec
December Commencement	Wed, 18 Dec
Christmas Furlough begins	Wed (CAD), 18 Dec

Second Semester—2020

Christmas Furlough ends	Mon (2200), 13 Jan
Registration	Tue, 14 Jan
Classes begin	Wed, 15 Jan
Last day for curriculum and course changes	Wed, 22 Jan
Spring Furlough	Thur (CAD)-Sun (2200), 12-22 Mar
Spring FTX	Fri (CAD)-Tue, 3-7 Apr
Easter Break	Fri (CAD)-Mon (2200), 10-13 Apr
1st Spring Reunion	Mon-Tue, 20-21 Apr
2nd Spring Reunion Weekend	Fri-Sat, 24-25 Apr
Classes end	Mon, 4 May
Reading Day	Tue, 5 May
Exams	Wed-Mon, 6-11 May
Institute Awards Ceremony	Thur, 14 May
Graduation Parade	Thur, 14 May
Baccalaureate	Thur, 14 May
Commissioning Ceremony	Fri, 15 May
New Market Day Ceremony	Fri, 15 May
Commencement	Sat, 16 May

Class Changes:

First Semester:

Monday classes meet on Wednesday, 4 September
No classes (Founder's Day), Mon, 11 November
Monday classes meet on Tuesday, 12 November

Second Semester:

Monday classes meet on Wednesday, 5 February
No classes (FTX), Monday & Tuesday, 6-7 Apr
Tuesday classes meet on Thursday, 9 April
No classes (Easter Break) on Monday, 13 Apr
Note: Dates are subject to change.

The Institute

An Education for Leadership in the 21st Century

Even in a world of change, some things never change. Society will always need educated and honorable men and women. And men and women will always need to lead lives of meaning and usefulness to others.

Established in 1839, VMI has shaped leaders, and individuals whose daily lives reflect the integrity, fairness, and appreciation for the value of work that is instilled here. The sense of mission at VMI is at the foundation of the Institute's tradition, teaching, and administration. It is alive in each cadet from the youngest Rat to the First Captain. Their pursuits, and now your pursuits, marked by words such as Honor, Character, and Wisdom, may seem romantic, even archaic, but they are, in fact, timeless and never needed more than now.

For the individual who wants an undergraduate experience more complete and transformative than an ordinary college or university can provide and more versatile in its applications than a military service academy affords, VMI offers a superb education. Its efficacy is well demonstrated by generations of VMI graduates. Among the alumni of VMI are: a Nobel Prize winner, eleven Rhodes Scholars, seven Medal of Honor recipients, a Pulitzer Prize winner, college presidents and generals and flag officers.

No other college in America is so attentive to and so proud of its product: citizen-soldiers prepared both for civilian leadership in their professions and for military leadership in times of national need. VMI graduates have made distinguished

contributions both in the military and in fields as diverse as business, engineering, international affairs, medicine, and public policy, often at remarkably young ages.

VMI's multi-faceted program is designed to instill in each cadet the lifelong values of integrity, devotion to duty, self-discipline, and self-reliance. Because cadets live and work in close association with fellow cadets, respect for the rights of others becomes their way of life and leads to a strong bond of loyalty.

Cadet Development Goals

Graduates of the Virginia Military Institute will:

Understand:

- The responsibilities of the Citizen-Soldier and the application of a broad liberal education in the arts, sciences and engineering to those responsibilities.
- The ideals of the American Constitution and the responsibilities of service to the Nation and its defense.
- The values and ethical standards of commissioned service to the Nation.

Demonstrate:

- The ability to anticipate and respond effectively to the uncertainties of a complex and changing world.
- Intellectual curiosity, imagination, and creativity.
- The ability to recognize moral issues and apply ethical considerations in decision making.
- The ability to act rationally and decisively under pressure.
- Mastery of the basic military skills required for entry into commissioned service.
- A commitment to physical fitness and wellness, including the physical skills required for entry into commissioned service.
- The ability to understand and apply the art and science of leadership to inspire, motivate, and develop subordinates, accomplish organization goals, and lead in a complex and changing world.

Historical Development

Before its formation as an institution of higher education in 1839, VMI's site was occupied by an arsenal, one of three in the State of Virginia.

In 1834, several of Lexington's leading citizens, including attorney John Thomas Lewis Preston, proposed that the arsenal be transformed into a military college so the cadets could pursue educational courses while protecting the stand of arms. The plan led to legislation establishing the Virginia Military Institute.

It was Preston, generally credited for conceiving the idea of VMI, and later one of the original members of the faculty, who gave the new institution its name: "Virginia—a State institution, neither sectional nor denominational. Military—its characteristic feature. Institute—something different from either college or university. The three elements thus indicated are the basis of a triangular pyramid, of which the sides will preserve their mutual relation to whatever height the structure may rise." The first president of the Board of Visitors was Colonel Claudius Crozet, a graduate of Ecole Polytechnique and former faculty member at West Point, who was the state engineer of Virginia at the time of his election to the board.

On November 11, 1839, 23 young Virginians were mustered into the service of the State and, in a falling snow the first cadet sentry, John B. Strange, relieved the old arsenal guard. To this day cadets perform guard duty and serve the state as a military corps, as the first Corps of Cadets did.

Professor (later Major General) Francis H. Smith, a graduate of the United States Military Academy, was named the first Superintendent of VMI and presided over the affairs of the Institute for its first half-century. During his tenure, the Corps increased in size, the curriculum broadened, and the faculty grew. Among them was a moody, eccentric professor of "natural philosophy"—"physics," it is called today—named Thomas Jonathan Jackson, who joined the faculty in 1851 and served until April, 1861, when he joined the Confederate forces and earned the name "Stonewall." He is considered one of the greatest commanders in military history.

During the Civil War, cadets helped train troops, were called into active service a number of times, and on May 15, 1864, fought in a pitched battle as a unit. That battle, at the small Shenandoah town of New Market, claimed the lives of 10 cadets. Six of the dead are buried on the VMI grounds. The Corps of Cadets pays tribute to the courage and valor of the New Market Cadets in formal ceremonies held at the Institute yearly on May 15. Union forces shelled and burned on June 12, 1864. The efforts of General Smith and dedicated members of the faculty allowed the Institute to reopen on October 17, 1865.

The devoted service of the thirteen Superintendents who have followed General Smith has enabled the Institute to strengthen its position as a uniquely valuable source of honorable and dedicated citizen-soldiers for the commonwealth and the nation. Today's superintendent, Gen. J.H. Binford Peay III '62, brings to the Institute the valuable skills and perspectives he developed during a long military career, including service as vice chief of staff for the U.S. Army and as commander-in-chief of United States Central Command.

Among VMI graduates are General of the Army George C. Marshall, Class of 1901, the World War II Army Chief of Staff, architect of the Marshall Plan and Nobel Peace Prize winner, and Jonathan M. Daniels, Class of 1961, murdered during the Civil Rights struggles of the 1960s and named a martyr of the Episcopal Church for his sacrifice.

Early in VMI history, Colonel Preston declared that the Institute's unique program would produce "fair specimens of citizen-soldiers," and this observation has been substantiated by the service of VMI graduates in peace and war. Since the Institute was founded, VMI alumni have fought in every war involving the United States, starting with the Mexican War just four years after VMI graduated its first class.

VMI alumni continue to serve their nation with 266 having achieved the rank of General or Flag officer in the Armed Forces of the United States and several foreign countries, most notably Thailand and the Republic of China. During World Wars I and II, the Korean War, the Vietnam War, the Gulf War, and the wars in Iraq and Afghanistan more than 300 alumni made the ultimate sacrifice in service to their country.

VMI is proud of its uniquely rigorous and constantly evolving system of education, and its earned reputation as one of America's premier institutions of higher education. Our mission of producing leaders—educated men and women of unimpeachable character and absolute integrity—remains our clear focus today and for the future.

Admissions

Requirements

General

The Institute seeks to admit young men and women who aspire to both an academic degree and a military commission as the hallmarks of a complete VMI education. Applicants are normally not less than sixteen (16) or more than twenty-two (22) years of age at matriculation and may not be married and/or the parent of a child. An age waiver may be granted for an applicant who has served on active duty in the armed forces, or if other circumstances dictate a waiver of the policy. VMI is a member of the National Association for College Admission Counseling (NACAC) and endorses the association's Statement of Principles of Good Practice (SPGP). For more information please visit *https://www.nacacnet.org*.

Medical

If an applicant is offered a Conditional Appointment on the basis of academic credentials presented, he or she must be approved medically to complete the reservation process and enroll. Cadet life is a rigorous four years of mental and physical challenges. Cadets must fully participate in all required activities including the intense fourth-class year, Institute and ROTC physical fitness tests, and mandatory physical education and ROTC courses. The Institute will evaluate each applicant's medical and physical condition to ensure they can complete all elements of VMI's rigorous co-curricular program. The specific program requirements are enumerated on the VMI Admissions website. All potential applicants should review them carefully. VMI will also consult Department of Defense medical standards for reference. However, each application will be reviewed individually to ensure that the program requirements can be met and the prospective cadet can safely and successfully enroll at VMI.

If the Institute Physician determines the applicant may not be able to meet the established program requirements, he will request more information from the applicant. If his concerns persist, he will forward the medical information to the Commandant of Cadets and the Head of the Department of Physical Education (Fitness Review Panel). Each member of the panel will submit a recommendation on eligibility to the Superintendent. The Superintendent's decision will be final.

Admission to VMI does not guarantee that a cadet will be eligible for commissioning. Only ROTC departments can determine eligibility for commissioning. Any questionable medical condition should be directed to the appropriate ROTC department.

Applicants are advised that failure to report previously existing medical conditions will be grounds for termination of their cadetship with forfeiture of appropriate tuition and fees. Cadets who become unable to participate fully in all aspects of cadet life will be evaluated for retention on a case by case basis by Institute officials.

Academic Record

A college preparatory course comparable to the Commonwealth of Virginia's Advanced Studies Program, or higher, is preferred. The applicant should present a secondary school record showing at least 16 academic units earned by the time of graduation. The 16 units must include **at least four in English, two in algebra, and one in geometry.** The distribution cited is desirable, but minor exceptions may be made if the record is otherwise sufficiently promising.

English ..... 4 units
Algebra ..... 2 units
Geometry ..... 1 units
Advanced mathematics ..... 1 units
Social studies ..... 3 units
Laboratory sciences ..... 3 units
Foreign language (3 years of one, or two years of two each) ..... 3-4 units
Electives ..... 2 units
Total Academic Units ..... 19-20 desirable

Equally important is the quality of the applicant's record as measured by grades, class rank, scores on standardized tests of aptitude, and the school's evaluation of leadership and academic promise. VMI has not set rigid minimum requirements in these respects, but in general it is expected that the applicant will rank in the top half of the class with grades substantially above passing and that College Board and other test scores will be above average or better.

Standardized Tests

The following standardized tests are required or recommended, as stated, for all applicants:

1. **Required:** College Board Scholastic Aptitude Test (SAT I) or American College Testing Program (ACT).
2. **Required:** [if applicant's first language (mother tongue) is not English]: College Board Test of English as a Foreign Language (TOEFL).

The SAT or ACT should be taken in the senior year no later than December. If they are taken after these dates, consideration of the application must depend on space availability when the scores are received.

Prospective applicants are strongly encouraged to try the SAT and ACT in their junior year of high school and to repeat the test in their senior year, thereby enhancing the usefulness of the measurement.

Information about the SAT or ACT may be obtained from the applicant's high school guidance office. VMI's code for the SAT is 5858. VMI's code for the ACT is 4418.

Essay

Although an essay is not required, it is encouraged. The applicant may wish to submit a one-page essay on a topic of their choice or a graded essay from a high school class.

Extracurricular Achievements

Since the VMI cadet is being trained for leadership, extracurricular achievement indicative of leadership potential, physical and moral stamina, and adaptability to a disciplined environment is important as are significant academic honors. A partial list of significant achievements would include membership in student government organizations, the National Honor Society, editorship of student publications, athletic awards, significant civic or church work, and honors in such organizations as the Girl Scouts and Boy Scouts. Such achievements are not a substitute for academic qualifications, but they do represent an important supplement.

Character Recommendations

Satisfactory character and personality evaluations must be furnished by the secondary school or schools attended by the applicant unless precluded by school policy. One or two letters of recommendation may be helpful if written by persons who **know the applicant well,** especially if the writer's relationship to the applicant has

been that of teacher, employer, or leader in some significant activity, or if the writer is a VMI alumnus.

Interviews and Visits

It is strongly recommended, though not required, that applicants visit VMI for an interview and a tour of the post. Both usually can be accomplished within a morning or afternoon. The Admissions Office will arrange for interviews and tours as far as possible to suit the convenience of the applicant, who should cite a preferred date when writing for an appointment. Preferred times Mon.-Fri. are 9-11:30 a.m. and 1-3:30 p.m.

Summar

The purpose of entrance requirements is to protect the standards of the college and also the interests of the applicant, which are not served if the applicant is accepted into a program for which he or she is unprepared. All measurements (academic record, class rank, SAT/ACT, etc.) are correlated and weighed in the final determination of the applicant's qualifications.

Matriculation Agreement

Every cadet, upon matriculation, is required to sign the following pledge, which is binding upon the cadet from the day it is signed until all official connection with the Institute is severed:

"I hereby engage to serve as a cadet in the Virginia Military Institute for the term for which I have entered, and I promise, on my honor, while I continue to be a member of the Corps of Cadets, never to lie, cheat, steal, nor tolerate those who do. I will, to the best of my ability, discharge all of my duties as a cadet with regularity and fidelity, and I will obey all the legal orders and constituted authority of the Institute. I further affirm that I am an unmarried person; that I am not a parent; and that never, during the term of my cadetship, will I join or affiliate with any secret society, fraternity, or sorority."

How and When to Apply

Applications can be submitted electronically (*http://www.vmi.edu/admissions-and-aid/apply/*) or in paper form. New cadets, whether first time freshmen or transfers, are enrolled only at the beginning of each new session in August. The application form and all required items for application must be received between September 1 and February 1 for those applying for regular decision. Applicants should submit the following items:

1. The completed application form.
2. Application fee of $40, this being a non-refundable fee.
3. An official transcript of the high school record.
4. Official standardized test (SAT/ACT) scores.
5. Secondary School Report Form.
6. Guidance Counselor/School Administrator Recommendation Form.
7. College Report Form (Transfer students only).
8. Virginia Domicile Application Form (Virginia residents only).

Processing of Applications

Decisions

Applicants meeting the November 15 deadline for early decision will be notified no later than December 15. On a rolling basis, decisions will be made on all applications for regular decision and those applicants deferred from early acceptance. Although some outstanding applicants may be offered appointments during this initial review process, most applicants will be notified of a decision by 1 April. A waiting list may be necessary.

Reservations

Accepted applicants will be sent appointments which are tentative pending establishment of a reservation. A reservation requires approval of satisfactory medical and dental reports, a signed acceptance of the appointment, and payment of a $300 advance deposit. The advance deposit is deducted from the total charges for the first year of enrollment. It is refundable if requested in writing before May 1, or if the applicant is found physically disqualified.

Conditions

VMI reserves the right to cancel any appointment or reservation if the recipient is found to be physically disqualified or if a subsequent academic or conduct record is found unsatisfactory. Entrance requirements must be fully met before the date of matriculation. No one will be admitted on probation.

Advanced Standing Credit

Advanced standing credit is defined as the assignment of new cadets to advanced courses, with or without semester hours credit, for which they have qualified by one or more of the following means:

1. **College Board Advanced Placement Examinations.** The College Board offers Advanced Placement Examinations annually in May, each based on a typical college-level course. These examinations are designed for students who have had special secondary school preparation. Elective credit is given for grades of 3, and selective semester hour credit may be awarded for grades of 4 or 5 (honors and high honors). VMI Advance Placement Examination Award Credit: *http://www.vmi.edu/media/content-assets/documents/registrar/Advance-Placement-Awards.pdf*
2. **International Baccalaureate Courses.** VMI recognizes the advanced level of academic preparation of students completing the IB Diploma or IB courses and encourages participation in the program. Academic credit and/or advanced placement is determined by the appropriate academic department head. Generally, semester hour credit may be awarded for exam scores of 5 or higher. Elective credit is awarded for scores of 4. VMI International Baccalaureate Awards: *http://www.vmi.edu/media/content-assets/documents/registrar/International-Baccalaureate-Awards.pdf*
3. **Cambridge International Exams.** Based on an evaluation of the 2012 Cambridge International Exam syllabi, the following VMI course equivalents are acceptable for credit for incoming Cambridge International A-Level transfer activity. A grade of "C" or better is required unless otherwise indicated. *http://www.vmi.edu/media/content-assets/documents/registrar/Cambridge-Credit-Awards.pdf*
4. **VMI Placement Examinations.** All new cadets are tested for placement in the proper level mathematics course. Cadets who have taken two or more years of a modern foreign language while in grades 9 through 12 are tested for language placement, regardless of their curricular choice. The test results, the high school record,

foreign residency, and in some cases, a personal interview will all contribute to the recommendation for placement into an appropriate level course. It is possible for a cadet to place out of a portion or all of the language requirement. Placement credit means that a designated course does not have to be taken. However, semester credit hours are not awarded with placement credit and the required hours must be earned by taking elective courses.

5. **Dual Enrollment or Attendance at Another College.** Subject to approval by appropriate curricular head, VMI will accept credits earned in another accredited college in advance of the applicant's matriculation, provided the course grade has been at least a "C" or the equivalent. Applicants should get advanced approval of course selections from the VMI Admissions Office. VMI/Virginia Community College Course Approvals: *http://www.vmi.edu/media/content-assets/documents/registrar/VA-Community-College-System-Course-Equivalencies.pdf*

Transfer From Another College

VMI welcomes applications from students wishing to transfer from another accredited college or university. The transfer policy may be summarized as follows:

1. **Residence.** VMI is a four-year undergraduate experience and it is expected that all cadets complete a majority of their requirements in residence. Cadets must complete a minimum of **six** semesters in residence at VMI (fall and spring semesters).
2. **Decisions.** The VMI Admissions Committee determines whether or not the transfer applicant is qualified for admission. If admitted, the academic department heads determine the acceptability of courses taken at the previous institution(s).
3. **Secondary school record.** All transfer applicants must submit an official transcript of their secondary school record. This should include standardized test scores (SAT or ACT). For those students whose first language is not English, the College Board Test of English as a Foreign Language (TOEFL) is required. Importance of the secondary school record will vary depending on how long the student has been enrolled in an accredited college program of study and its course content. In general, it is expected that the secondary school record will meet the VMI entrance standards. A one-page essay, on a topic of their choice, is optional for all students.
4. **The college record.** Transfer applicants must submit official transcripts on ALL college work attempted. To be competitive for appointment, transfer students should have at least a "B" (3.2 on a 4.0 scale) cumulative quality point average on all courses attempted. In addition they must be in good standing with respect to their academic and conduct records and eligible to return to the college, which must be accredited.
5. **Credit transfer.** Credit transfer will require a grade of "C" or better in the course without regard to grades achieved on other courses of the same sequence or the average grade for the sequence. Credit transfer will also require that content of the course be acceptable by the appropriate VMI curricular head toward fulfillment of baccalaureate degree requirements in that curriculum. Transfer courses that can be applied to degree requirements at VMI are determined by the curriculum selected. Transfer students are encouraged to review curriculum requirements in the VMI Catalogue to ensure appropriate course selection. No more than one-half of the total hours required for VMI graduation may be transferred. Quality points are not transferable. Quality points earned at other colleges before transfer to VMI are not counted in the computation of the 2.0 quality point average required for VMI graduation.
6. Those students enrolled in another college must submit an official college transcript and catalogue in order to have these courses evaluated by the appropriate academic department head. Students enrolled in courses offered by the **Virginia Community College System** are directed to view the VCCS course listing in the VMI Transfer Guide to determine transferability of credits prior to enrolling in any course. Foreign students are encouraged to have their transcripts evaluated by a company providing foreign credential services to ensure the maximum number of credits transfer.
7. All others should send a copy of the college catalogue with the course(s) you intend to take to the Transfer Coordinator, VMI Admissions Office, Lexington, VA 24450-0304. A summary report of transfer credit will be mailed to individuals after the applicant has been appointed.
8. **Class standing.** Transfer students are classified academically the same as entering first-time freshmen (fourth class) until they return for their second year at VMI. At that time they may request reclassification based on the total number of semester hours earned and prevailing academic standards for the upper classes.
9. **Waiver of transferable credits.** An applicant may waive transferable credits, with the exception of cadets using VA Education Benefits who are required to accept all transferable credits, and follow a regular fourth class (freshman) curriculum, but exercise of this option does not exempt the transfer from meeting all entrance standards for transfer applicants.
10. **ROTC credits.** If the applicant is a transfer student and desires to pursue an Army commission, he/she can receive credit for the AROTC Basic Course (1st/2nd year) by completing one of the following: attending a four-week Leadership Training Camp at Ft. Knox, KY, having participated in a Junior ROTC program during high school or having been prior enlisted in which credit will be given on a case-by-case basis. Transfers may also arrange to take first and second-year Basic ROTC courses simultaneously at VMI if they lack credit for the first year. For additional information on each service's requirements, contact the individual ROTC offices.
11. **Matriculation of transfers.** Accepted transfer applicants are matriculated only at the beginning of the academic year in August. Mid-year transfer is not possible.

Applicants Whose First Language is Not English

Applicants whose first language is not English must also take the Test of English as a Foreign Language (TOEFL). High school guidance counselors should be consulted for information. Outside the United States, American embassies, consulates, offices of the U.S. Information Service, or other educational agencies can provide information. If information is not locally available, foreign applicants should write to TOEFL, Educational Testing Service, Princeton, New Jersey 08540. Foreign applicants must present evidence of adequate financial resources.

Immunizations

The following immunizations are compulsory for entrance to VMI:

1. Tetanus. After primary immunization, a booster must have been administered within six years of the date of matriculation in August. The booster should include pertussis.
2. Poliomyelitis.
3. Measles—Mumps—Rubella (MMR). Two immunizations are required. The first must have been administered **after the first birthday;** the second immunization **no sooner than one month later and any time thereafter.**
4. Meningococcal Vaccination.
5. Hepatitis B (series of 3 vaccinations)

6. Varicella (chicken pox)—vaccination required if applicant has not had the chicken pox.

Computers

VMI uses computers extensively in classes across the entire range of curricular offerings. Because substantial resources have been committed to the effective use of technology in teaching, communication, and information management across post, prospective cadets are required to have achieved basic competency in core computer skills and the following Microsoft Office applications: Word, Excel, Outlook, and PowerPoint. Individual departments may require competency at higher levels in additional areas or with particular software suites.

In order to satisfy Institute-specific requirements regarding space efficiency, low power consumption, and portability, cadets are only authorized to bring laptop computers with them for use at VMI. Purchasing IT-approved, recommended laptop models will ensure prompt priority support and quick turn-around time for any parts ordered. All cadets benefit from the Institute's Microsoft Campus Agreement, which allows cadets to used VMI-licensed Microsoft Windows and Office software on their laptops at no cost.

The Barracks IT Help Desk is the central location for technical support for cadets. The Help Desk provides answers to technical questions, lost password assistance, troubleshooting, and repair for all cadet-owned computers. The Barracks Help Desk is open from Monday through Friday.

VMI has furnished over 200 public computers for cadet use in its academic buildings, including the Barracks Study Room, a computer lab in the barracks (adjacent to the Barracks Help Desk) that is open 24 hours per day, seven days per week. Barracks rooms are configured to allow cadets access to the VMI network and the Internet via a wired connection only. VMI IT is expanding wireless connectivity throughout post, but wireless coverage is not currently provided inside the Barracks.

For additional information regarding support of cadet-owned computers, please visit VMI's Information Technology department at *http://www.vmi.edu/about/offices-a-z/it/*, or contact the IT Help Desk at *help@vmi.edu*.

Readmission of Former Cadets

Cadets separated from the Corps by resignation, failure to pre-register, suspension, medical furlough, or failure of eligibility must apply to be readmitted. The readmission of any cadet is based on the merit of the application, and the likelihood for successful completion of the military and academic components of the program. A full assessment will be completed as to whether the cadet could safely return to fully participate in all academic and physical components of the VMI program, and successfully integrate into the VMI military and class structure. Cadets seeking readmission must be able to meet weight/body fat standards and be able to pass the VFT. Those not meeting standards will not be allowed to re-enroll.

VMI reserves the right to deny readmission to a cadet who has been separated from the Institute longer than two years, or if a cadet cannot successfully integrate into the Corps to complete the requirements as stated above.

For a complete outline of the readmission standards, deadlines and forms, see VMI's website at *http://www.vmi.edu/academics/dean-of-the-faculty/registrar/readmission/*.

Readmission Deadlines:

Fall Semester: ..... June 1
Spring Semester: ..... November 1

Completed applications and supporting paperwork must be submitted to the Registrar's Office, 303 Shell Hall by the designated deadline. All deadlines will be strictly enforced, and late applications will be considered for the next eligible semester based on the date of submission.

Cadets dismissed for disciplinary reasons may petition for readmission after being absent from VMI for one full calendar year. The status will be reconsidered based on the presentation of new evidence or extenuating circumstances.

Nondiscriminatory Policy

Applicants are admitted entirely on the basis of their academic record, physical fitness/condition, and character without reference to national origin, creed, color, or gender. If you have questions regarding the admissions process, please contact the VMI Admissions Office, 800-767-4207. See full non-discrimination statement.

Costs and Payment Schedule

Tuition, Fees, and Deposits 2019-2020 Session

Tuition and Fees	Virginians	Non-Virginians	International
Tuition	$ 9,284	$ 36,128	$ 36,128
Room	2,924	2,924	2,924
Board	6,842	6,842	6,842

Auxiliary Fees

Medical	512	512	512
Athletic	3,544	3,544	3,544
Cadet Facilities/Activities	2,302	2,302	2,302
Total Tuition and Fees	**25,408**	**52,252**	**52,252**

Quartermaster Charge

Laundry/Pressing	418	418	418
Haircuts	288	288	288
Uniforms	2,770	2,770	2,770
Total	**28,884**	**55,728**	**55,728**
Security Deposit (New and Readmits only)	200	200	200
Health Insurance (International cadets only)			1,000
Total Cost	**29,084**	**55,928**	**56,928**

The **QUARTERMASTER CHARGE** covers haircuts, and the issuing, tailoring, laundering, and pressing of uniforms. Cadet uniforms are state property and must be returned to the Institute.

The **SECURITY DEPOSIT** covers damages and/or loss of Institute property and unpaid obligations to VMI. VMI returns (without interest) this deposit, less any deductions for damages or unpaid obligations, upon the graduation of the cadet or the termination of the cadetship. This deposit is not the same as the Reservation Fee.

HEALTH INSURANCE is required for all International cadets. The amount included is an estimate for the 2019-2020 academic year. Please contact the Office of International Programs for specific coverage information.

Payment Schedule

Payment Schedule	Virginians	Non-Virginians	International
Reservation fee Due 1 May 2018	$ 300	$ 300	$ 300
On or Before 1 August 2018	14,342	27,764	28,764
On or Before 18 December 2018	14,442	27,864	27,864
Total	**29,084**	**55,928**	**56,928**

A **LATE FEE** of $100 or 10% of the unpaid balance, whichever is less, will be assessed for failure to pay tuition and fees as required. In addition, a $100 late registration and enrollment fee will be assessed to all cadets who fail to pre-register or enroll by the appropriate deadlines.

OTHER COSTS payable by the cadet include textbooks, supplies, automobile registration, and non-issue clothing. The cadet must pay for such items with cash, check, or bank credit card at the time of purchase. The Institute reserves the right to hold grades, credits, transcripts and diplomas until all financial obligations to the Institute are satisfied. Cadets must satisfy all financial obligations to the Institute for past semesters or terms before they will be allowed to register for any succeeding semester or term.

Refund Policy

Tuition and fees are refundable in part only upon official notice of withdrawal to the Commandant.

7. Full refunds, less $1,000 are made for withdrawals prior to the first day of classes.
8. On or after the first day of classes, refunds are prorated through the fifth week.
9. No refunds are made after the fifth week of classes.
10. Cadets receiving Title IV financial aid will receive a refund in accordance with applicable federal law.

Exceptions to the refund policy are made only in extraordinary circumstances. Appeals for exception will be considered by the Tuition Appeals Committee upon written request to the Comptroller, no later than 90 days after withdrawal from the Institute.

No refunds will be made until all issued military uniforms and equipment required to be returned have been received in good condition by the Commandant and the Military Store. **Cadets will be charged for issued military uniforms and equipment which are not returned as required.**

Residency

All students who wish to apply for in-state tuition rates must submit the two-page Application for Virginia In-State Tuition Rates that accompanies the application for admission. Entitlement to in-state tuition rates must be demonstrated in accordance with Section 23.1-500 et seq. of the Code of Virginia.

After admission, it is the duty of the cadet to provide written notification within 30 days to the VMI Registrar of any changes of address or domiciliary status affecting the cadet or his/her parents.

Cadets will be required to provide a yearly affirmation of their permanent residence address, as well as their parents' permanent residence address. Changes from out-of-state to in-state status requests are reviewed by the Registrar. All changes require the completed application for Virginia In-State Tuition Rates and accompanying documentation (if requested). Residence in the Commonwealth for purposes of obtaining an education does not qualify a cadet for Virginia residency status. For more information, please visit the VMI website at: *http://www.vmi.edu/registrar*, or call 540-464-7213, or write to Registrar, Virginia Military Institute, 303 Shell Hall, Lexington, Virginia 24450-0304

ROTC Benefits

The cost of attending VMI should be viewed together with the other benefits a qualified ROTC cadet receives. Currently, these benefits include:

» Uniform allowance averaging $3,700 over four years depending on the service.
» Tax-free subsistence allowance of about $250 to $500 per month when contracted in a ROTC program.
» Summer/training pay which varies with type and length of training and cadet status (contracted/non-contracted, and scholarship/non-scholarship)...

Senior Citizens

Pursuant to Virginia Senior Citizen's Higher Education Act, any individual over the age of 60, who is a Virginia domiciliary for a minimum of one year and earns less than $23,850 annually, and who otherwise meets the summer admission criteria of the Virginia Military Institute (See Summer Session Catalogue) may attend free of tuition and fees. The admission criteria for summer session are substantially more lenient than the criteria for VMI's full time, academic year, program. VMI does not offer a part-time enrollment option during the regular academic year. Application and receipt of documentation (State and Virginia tax returns with W-2 form(s), documentation of disability status or IRS Letter of Non-Tax Filing documentation for the previous year) must be completed and approved prior to the start of any summer session term.

Veterans Access, Choice, and Accountability Act of 2014

U.S. Code, 38 U.S.C. 3679(c). Veterans Access, Choice, and Accountability Act of 2014

The following individuals shall be charged a rate of tuition not to exceed the in-state rate for tuition and fees purposes:

» A Veteran using educational assistance under either chapter 30 (Montgomery G.I. Bill—Active Duty Program) or chapter 33 (Post-9/11 G.I. Bill), of title 38, United States Code, who lives in the state in which the institution is located (regardless of his/her formal State of residence) and enrolls in the institution within three years of discharge or release from a period of active duty service of 90 days or more.

» Anyone using transferred Post-9/11 GI Bill benefits (38 U.S.C. § 3319) who lives in the state in which the institution is located (regardless of his/her formal State of residence) and enrolls in the institution within three years of the transferor's discharge or release from a period of active duty service of 90 days or more.

» Anyone described above while he or she remains continuously enrolled (other than during regularly scheduled breaks between courses, semesters, or terms) at the same institution. The person so described must have enrolled in the institution prior to the expiration of the three year period following discharge or release as described above and must be using educational benefits under either chapter 30 or chapter 33, of title 38, United States Code.

» Anyone using benefits under the Marine Gunnery Sergeant John David Fry Scholarship (38 U.S.C. § 3311(b)(9)) who lives in the state in which the institution is located (regardless of his/her formal State of residence). Individuals using the Marine Gunnery Sergeant John David Fry Scholarship are no longer required to enroll within three years of the service member's death, and there is no longer a requirement that the deceased service member's death in the line of duty followed a period of active duty service of 90 days or more.

» Anyone using transferred Post-9/11 G.I. Bill benefits (38 U.S.C. § 3319) who lives in the state in which the institution is located (regardless of his/her formal state of residence) and the transferor is a member of the uniformed service who is serving on active duty.

For more information please contact:

Applicants: Admissions—540-464-7211

Current Cadets: Registrar's Office—540-464-7213

Financial Aid

The purpose of the VMI financial aid program is to provide financial assistance and counseling to cadets and prospective cadets so as to reduce the financial barriers that could hinder enrollment, retention, and success at VMI. Awards are based on the cadet's demonstrated financial need as determined through the Free Application for Federal Student Aid (FAFSA). The FAFSA is available on-line at *https://studentaid.ed.gov/sa/fafsa*.

Sources of aid at VMI include Federal Direct Loans, Federal Pell Grants, Federal Supplemental Educational Opportunity Grants, Commonwealth of Virginia Programs, need-based and merit based scholarships endowed through the VMI Foundation, Inc. and athletic scholarships provided by the VMI Keydet Club.

Federal Direct Loans are available regardless of need. Cadets must apply for financial aid by submitting the FAFSA and VMI Financial Aid Application before they can be considered for a Federal Direct Loan. Parents can borrow up to the full cost of their child's education through the Federal PLUS Loan Program. There must be a current FAFSA on file for the student before the parent can utilize the Federal PLUS Loan. More information on the Federal Direct Loan programs may be found at *https://studentloans.gov*.

Normally, payment of all financial aid awards is made in two installments, credited to the cadet's account in each semester of the school session. Statements provided on PostView will reflect credit for aid awarded. In the event of withdrawal before the end of the refund period, financial aid will be pro-rated. Renewal of financial aid is not automatic and cadets must apply for aid each year by submitting a completed FAFSA and the VMI Financial Aid Application by 1 March. The FAFSA may be completed on-line at *https://studentaid.gov/sa/fafsa*.

ROTC Scholarships. For information on applying for such grants, see Reserve Officers Training Corps.

State Cadets. These are residents of Virginia who receive special appointments by the Board of Visitors, as specified in the Code of Virginia. The board shall provide financial assistance equal to a state cadet applicant's demonstrated need up to the Institute's prevailing charges for tuition, mandatory fees, and other necessary charges. State Cadetships, which are limited in number, are restricted to bona fide residents of Virginia, and applicants are required to show, on the basis of need, that it would be impossible to attend VMI without this financial assistance. Applications are made on forms which will be furnished by the Financial Aid Officer on request, and these applications should be submitted before 1 March of the year in which the applicant wishes to enter VMI.

Upon receiving a State Cadetship, the State Cadet must assume certain obligations to the Commonwealth of Virginia in return for the financial assistance awarded through the Cadetship. The Sections of the Code of Virginia setting forth provisions for State Cadetships and the obligations concerned may be obtained from the Financial Aid Office. Applicants for a State Cadetship also need a recommendation from their State Senator.

Institute Scholarship Program. Institute Scholarship opportunities are available each year to outstanding cadets with well-balanced high school records that include athletics and leadership roles. Normally, applicants should score at least 1350 (combined) on the SAT or at least 32 on the ACT and have a high school GPA of at least 3.7. Selection is based on merit; financial need is not a criterion. Institute Scholarships are renewable annually as long as the recipient maintains a cumulative GPA of 3.5, membership in the Institute Honors Program, and a satisfactory conduct record. For information, please contact the Associate Dean for Academic Affairs, 210 Smith Hall.

How to Apply for Financial Aid

Prospective and returning cadets should complete the FAFSA and VMI Financial Aid Application by March 1st.

The forms to be completed are as follows:

1. The Free Application for Federal Student Aid (FAFSA) which is mandatory and may be completed on the internet at *https://studentaid.gov/fafsa* . All applicants should indicate on the form that VMI may have access to the needs analysis information by entering VMI's Title IV code—003753. This form is available October 1st each year.
2. VMI Financial Aid Application which is available online at *http://www.vmi.edu/financialaid*.

Satisfactory academic progress and good conduct standing must be maintained in order to receive financial assistance.

Final decisions on financial aid awards for incoming cadets begin in February and are completed by mid-April. Applicants are normally notified no later than early May. Returning cadet financial aid awards are completed once final grades are posted. Cadets are notified by mid-June.

Financial Aid Awards

Awards consist of grants, scholarships, and loans and are awarded based on **demonstrated financial need** and a listing of applicable federal and state programs is available on the VMI Financial Aid Office website, *http://www.vmi.edu/financialaid*.

Satisfactory Academic Progress (SAP) Policy and Awarding of Federal Financial Aid

I. Purpose

The establishment of a Satisfactory Academic Progress policy at the Virginia Military Institute (VMI) is mandated by the Department of Education in order to be eligible for Federal Title IV aid. All schools that receive these funds must have a reasonable policy for monitoring that progress. The Department considers a satisfactory academic progress policy to be reasonable if it meets both the qualitative and quantitative criteria established by the school.

II. Definitions

» Regular semester denotes fall term or spring term
» Full-time student is enrolled in at least 12 credit hours per semester
» Completed semester hours are hours successfully completed with a passing grade
» Attempted semester hours are hours attempted and successfully completed or not successfully completed. Attempted semester hours include incompletes, official withdrawals, unofficial withdrawals, unsatisfactory grades, failing grades, repeated and audited courses, and transfer courses.
» Title IV funds include Federal Pell Grant, Federal Supplemental Educational Opportunity Grant, Federal Direct Subsidized, Unsubsidized and PLUS Loans.
» Academic year reflects Summer Transition Program (first year cadets only), fall semester, spring semester and summer I and summer II.

III. Requirements

The eligible Title IV applicant at VMI must meet all of these minimum requirements: qualitative, quantitative and maximum timeframe as defined below. More detailed information is provided in the Academic Standards as published by the Registrar's Office and approved by the Deputy Superintendent for Academics.

» Qualitative Requirement. Minimum cumulative grade point average (GPA) per established academic standards. See Academic Standards.
» Quantitative Requirement. Cadets must, at a minimum, receive satisfactory grades in 80% of cumulative credits attempted. This calculation is performed by dividing the cumulative total number of successfully completed credits by the cumulative total number of credits attempted. All transfer credits accepted count as both attempted and completed.
» Maximum Timeframe. All cadets must complete program requirements within 10 regular semesters.

Notification. VMI measures Satisfactory Academic Progress at the end of each spring semester. The Financial Aid Office suspends Federal Title IV aid, to include VA educational benefits, and notifies each cadet who fails to meet all three measures of academic progress (qualitative, quantitative, and maximum timeframe).

Appeal. A cadet has the right to appeal the decision to suspend Title IV eligibility based on failure to meet minimum standards of academic progress. The Financial Aid Office provides the appeal form and reviews each appeal promptly and notifies the cadet of its decision. Cadets are limited to one financial aid appeal per cadetship.

Categories for appeal consideration include:

» Medical (Injury/Illness of cadet)
» Death of a relative (immediate family member)
» Military service/mobilization
» Other special circumstances

Reinstatement. A cadet who is not making satisfactory academic progress and loses Title IV eligibility may attend VMI without benefit of Title IV aid if the cadet is otherwise eligible to enroll. If the cadet's academic progress improves and meets the standards of satisfactory academic progress, eligibility for Title IV aid will be reinstated for the following regular term. Cadets are encouraged to take advantage of VMI Summer Sessions I and II in order to improve their academic standing. They may also attend summer school in their local area and have these courses used to improve their eligibility for meeting SAP. All transfer courses must be submitted and approved through the VMI Registrar's course evaluation process before enrolling in any transfer course(s).

IV. Applicability

This policy shall apply to all enrolled cadets.

Virginia Military Survivors and Dependents Education Program

A state program for bonafide Virginia residents whose parents were killed or permanently disabled due to war service or who were taken prisoners of war or missing in action. Upon determination of eligibility by the Virginia Department of Veteran Services, tuition and mandatory fees will be waived. In addition, as funds are available, eligible students may receive a stipend to offset other educational expenses. Once declared eligible, the DVS will send VMI a letter certifying your eligibility and period of eligibility. Report to the Financial Aid Office to have your enrollment completed.

For more information telephone the VMI Financial Aid Office at 540-464-7208 or call the Dept. of Veterans Services at 804-225-2083. Or find the VMSDEP website, *https://www.dvs.virginia.gov/education-employment/virginia-military-survivors-and-dependents-education-program-2-2*.

Federal Veteran Education Benefits

To receive benefits under the VA Chapter 33 Post 911, Chapter 35 Dependents and Survivor program, or GI Bill Chapter 1606 the student/parent must apply to the VA online. All eligible students must then bring their "Certificate of Eligibility" or "Notice of Basic Eligibility" to the Financial Aid Office in order to process their claims. Returning eligible cadets must re-apply for this benefit each year through the Financial Aid Office. All cadets using VA education benefits are required to meet published Satisfactory Academic Progress requirements in order to maintain access to these funds.
Title 38 United States Code Section 3679(c) as amended.

The following individuals shall be charged the in-state rate, or otherwise considered a resident, for tuition purposes:

» A Veteran using educational assistance under either chapter 30 (Montgomery G.I. Bill—Active Duty Program) or chapter 33 (Post-9/11 G.I. Bill), of title 38, United States Code, who lives in the Commonwealth of Virginia while attending a school located in the Commonwealth of Virginia (regardless of his/her formal State of residence) and enrolls in the school within three years of discharge from a period of active duty service of 90 days or more.
» Anyone using transferred Post-9/11 GI Bill benefits (38 U.S.C. § 3319) who lives in the Commonwealth of Virginia while attending a school located in the Commonwealth of Virginia (regardless of his/her formal State of residence) and enrolls in the school within three years of the transferor's discharge from a period of active duty service of 90 days or more.
» A spouse or child using benefits under the Marine Gunnery Sergeant John David Fry Scholarship (38 U.S.C. § 3311(b)(9)) who lives in the Commonwealth of Virginia while attending a school located in the Commonwealth of Virginia (regardless of his/her formal State of residence) and enrolls in the school within three years of the Service member's death in the line of duty following a period of active duty service of 90 days or more.

An individual using educational assistance under chapter 31, Vocational Rehabilitation and Employment (VR&E) who lives in the Commonwealth of Virginia while attending a school located in the Commonwealth of Virginia (regardless of his/her formal State of residence) effective for courses, semesters, or terms beginning after March 1, 2019

Anyone described above while he or she remains continuously enrolled (other than during regularly scheduled breaks between courses, semesters, or terms) at the same institution. The person so described must have enrolled in the institution prior to the expiration of the three-year period following discharge or release as described above and must be using educational benefits under either chapter 30, chapter 33, or chapter 31 of title 38, United States Code.

Sec. 103. disapproval for purposes of educational assistance programs of Department of Veterans Affairs of certain courses of education that do not permit individuals to attend or participate in courses pending payment.

(a) **In General**.—Section 3679 of title 38, United States Code, is amended by adding at the end the following new subsection:

"(e) (1) Notwithstanding any other provision of this chapter, beginning on August 1, 2019, a State approving agency, or the Secretary when acting in the role of the State approving agency, shall disapprove a course of education provided by an educational institution that has in effect a policy that is inconsistent with any of the following:

"(A) A policy that permits any covered individual to attend or participate in the course of education during the period beginning on the date on which the individual provides to the educational institution a certificate of eligibility for entitlement to educational assistance under chapter 31 or 33 of this title and ending on the earlier of the following dates:

"(i) The date on which the Secretary provides payment for such course of education to such institution.

"(ii) The date that is 90 days after the date on which the educational institution certifies for tuition and fees following receipt from the student such certificate of eligibility.

"(B) A policy that ensures that the educational institution will not impose any penalty, including the assessment of late fees, the denial of access to classes, libraries, or other institutional facilities, or the requirement that a covered individual borrow additional funds, on any covered individual because of the individual's inability to meet his or her financial obligations to the institution due to the delayed disbursement of a payment to be provided by the Secretary under chapter 31 or 33 of this title.

"(2) For purposes of this subsection, a covered individual is any individual who is entitled to educational assistance under chapter 31 or 33 of this title.

"(3) The Secretary may waive such requirements of paragraph (1) as the Secretary considers appropriate.

"(4) It shall not be inconsistent with a policy described in paragraph (1) for an educational institution to require a covered individual to take the following additional actions:

"(A) Submit a certificate of eligibility for entitlement to educational assistance not later than the first day of a course of education for which the individual has indicated the individual wishes to use the individual's entitlement to educational assistance.

"(B) Submit a written request to use such entitlement.

"(C) Provide additional information necessary to the proper certification of enrollment by the educational institution."

(b) **Prompt Payments**.—(1) **In General**.—The Secretary of Veterans Affairs shall take such actions as may be necessary to ensure that the Secretary makes a payment to an educational institution on behalf of an individual, who is Section 103 Compliance Page 4 entitled to educational assistance under chapter 31 or 33 of title 38, United States Code, and who is using such assistance to pursue a program of education at the educational institution, not later than 60 days after the date on which the educational institution certifies to the Secretary the applicable tuition and fees for the individual.

(2) **Semiannual Reports**.—Not later than May 1 and October 1 of each year, the Secretary shall submit to the Committee on Veterans' Affairs of the Senate and the Committee on Veterans' Affairs of the House of Representatives a semiannual report summarizing any cases in which the Secretary failed to make a payment described in paragraph (1) within the period set forth in such paragraph and an explanation for each delayed disbursement of payment.

(c) **Rule Of Construction**.—In a case in which an individual is unable to meet a financial obligation to an educational institution due to the delayed disbursement of a payment to be provided by the Secretary under chapter 31 or 33 of such title and the amount of such disbursement is less than anticipated, nothing in section 3679(e) of such title, as added by subsection (a), shall be construed to prohibit an educational institution from requiring additional payment or imposing a fee for the amount that is the difference between the amount of the financial obligation and the amount of the disbursement.

"The Virginia State Approving Agency (SAA), is the approving authority of education and training programs for Virginia. Our office investigates complaints of GI Bill beneficiaries. While most complaints should initially follow the school grievance policy, if the situation cannot be resolved at the school, the beneficiary should contact our office via email *saa@dvs.vorginia.gov*."

For additional information on VA Education programs please visit the financial Aid office on our website *http://www.vmi.edu/about/offices-a-z/financial-aid/* or telephone the VMI Financial Aid office at 540.464.7208

The Academic Program

Accreditation

Virginia Military Institute is accredited by the Southern Association of Colleges and Schools Commission on Colleges to award Bachelor of Arts and Bachelor of Science degrees. Contact the Commission on Colleges at 1866 Southern Lane, Decatur, Georgia 30033-4097 or call 404-679-4500 for questions about the accreditation of VMI. VMI is a member of the American Council on Education, the Association of American Colleges, the College Entrance Examination Board, and the Association of Virginia Colleges. The chemistry curriculum is approved by the American Chemical Society. The Civil and Environmental, Electrical and Computer, and Mechanical Engineering programs are accredited by the Engineering Accreditation Commission of ABET, *http://www.abet.org*. The Economics and Business curriculum is accredited by AACSB International.

Academic Program Mission and Vision

Mission

The VMI Academic Program educates cadets in a rigorous academic environment that encourages life-long learning and develops citizens of character who anticipate, respond, and lead in a complex and changing world.

Vision

The VMI Academic Program includes:

1. **Curriculum** VMI offers cadets a challenging four-year core curriculum and fourteen nationally recognized majors in engineering, sciences, and the humanities with an array of enrichment opportunities provided through the Institute Honors Program, undergraduate research, foreign study, internships, and the Institute Writing Program.
2. **Cadets** VMI recruits, develops, and graduates cadets of exceptional talent, intellectual curiosity, and character, who possess a commitment to service and respect for others.
3. **Faculty** Ninety-eight percent of the VMI faculty hold Ph.D.'s. Our faculty is renowned for teaching excellence, mentorship of students, scholarly engagement, commitment to service, and encouragement of undergraduate research. Small class sizes enable faculty to interact closely with cadets both inside and outside of the classroom.
4. **Environment** The VMI environment includes state-of-the-art facilities, equipment, technologies, and instructional materials, first-class programs of academic support, and an organizational climate characterized by collegiality, cooperation, and respect.

Core Curriculum

The Core Curriculum develops foundational knowledge and skills that are essential to VMI's academic and military missions. Designed thematically as "The Nucleus of Effective Citizenship and Leadership," VMI's Core requirements are organized into four components.

- Key Competencies
  - Written Communication (ERH 101—ERH 102) 6 hours[1]
  - Oral Communication (ERH 103) 1 hour
  - Scientific Analysis (approved BI, CH, or PY sequence) 8 hours
  - Mathematical Reasoning (approved MA sequence) 6 hours
  - Physical Education (seven semesters) 4 hours
- Foundations of Citizenship and Leadership
  - Reserve Officers Training Corps (ROTC) 12 hours
  - PS 344—Leadership in Organizations 3 hours
- Perspectives on Civilization and Human Achievement
  - World History (HI 103—HI 104) 6 hours
  - Civilizations and Cultures (two courses)[2]
- Integrative Experiences
  - Writing-Intensive Courses (two courses)[3]
  - Capstone Experience variable

For updated information on the Core Curriculum go to: *http://www.vmi.edu/academics/majors-and-minors/core-curriculum/*.

The Academic Major

VMI believes that academic excellence is best maintained at a small college when the number of disciplines offering degrees is restricted. The choice between a course of study leading to a bachelor of arts or a bachelor of science degree is made before the cadet enters VMI. Transfer from one major field of study to another after matriculation is permitted based on the availability of the major and approval of the area department head.

A cadet may be awarded the degree of Bachelor of Science with a major in applied mathematics, chemistry, civil engineering, computer and information sciences, electrical and computer engineering, mechanical engineering, physics, physics (nuclear) or psychology; the degree of Bachelor of Arts may be awarded with a major in economics and business, English, history, international studies and political science, or modern languages and cultures. Either a Bachelor of Science degree or a Bachelor of Arts degree may be awarded in biology or chemistry. Detailed description of majors can be found in The Curricula.

Cadets may declare a double major if they meet specified academic standards and have the approval of both department heads. Only one bachelor's degree is awarded, but the cadet's academic transcript notes the double major.

To be graduated from VMI, a cadet must have a conduct record that is satisfactory to the Superintendent, must be confirmed by the Academic Board, must have completed all requirements for his or her major(s), must have attained a cumulative GPA of at least 2.00 (with no rounding up), must have attained a cumulative major GPA or at least 2.00 (with no rounding up) as determined by courses identified by the major department,

1 All activity must be passed with a grade of "C" or better.

2 One of these courses may be replaced by a credit-bearing, Institute-approved Study Abroad experience.

3 At least one of these courses must be in the major.

and must have been in residence at VMI for a minimum of 4-6 full-time semesters (see Academic Regulations to determine qualifying criteria).

Academic Minors and Concentrations

Cadets may also declare a minor and/or concentration in certain academic areas. The cadet should declare the minor or concentration as soon as possible and no later than the beginning of the first class year. A permit must be submitted to the Registrar, bearing the approval of the cadet's academic department head and the head of the department that offers the minor or concentration.

A 2.0 GPA must be maintained in the required course work and the cadet must meet any other criteria set by the department offering the minor or concentration. Official notice of the completed minor or concentration appears on the academic transcript and the graduation program. A cadet may drop a minor or concentration by submitting a permit with the signatures of the department heads to the Registrar.

Minors/concentrations are available in the following areas. Details are available under "The Curricula" in this catalog.

Minors

Sponsoring Department	Area
English, Rhetoric, and Humanistic Studies	Art History and Visual Culture Minor
International Studies	Asian Studies Minor
Physics and Astronomy	Astronomy Minor
Economics and Business	Business Minor
Chemistry	Chemistry Minor
Computer and Information Sciences	Computer and Information Sciences Minor
Electrical and Computer Engineering	Computer Engineering Minor
Computer and Information Sciences	Cybersecurity Minor
Economics and Business	Economics Minor
Biology / Physical Education	Exercise Science Minor
History	History Minor
International Studies	International Studies Minor
Psychology	Leadership Studies Minor
English, Rhetoric, and Humanistic Studies	Literary Studies Minor
Applied Mathematics	Mathematics Minor
History	Middle Eastern Studies Minor
History	Military History Minor
Modern Languages and Cultures	Modern Languages Minor—Arabic, French, German, Spanish, Etc.
International Studies	National Security Minor
English, Rhetoric, and Humanistic Studies	Philosophy Minor
Physics	Physics Minor
Psychology	Psychology Minor
English, Rhetoric, and Humanistic Studies	Rhetoric and Writing Minor

Concentrations

Sponsoring Department	Area
Mechanical Engineering	Aerospace Engineering Concentration
English, Rhetoric, and Humanistic Studies	Art History and Visual Culture Concentration
Biology & Chemistry	Biochemistry and Molecular Biology (BMB) Concentration
Biology	Ecology, Conservation, and Organismal Sciences (ECOS) Concentration
Economics and Business	Financial Management Concentration
Economics and Business	Global Management Concentration
International Studies	Interdisciplinary Studies in Latin America Concentration
English, Rhetoric, and Humanistic Studies	Literary Studies Concentration
History	Military History Concentration
Mechanical Engineering	Nuclear Engineering Concentration
English, Rhetoric, and Humanistic Studies	Philosophy Concentration
English, Rhetoric, and Humanistic Studies	Rhetoric and Writing Concentration

Special Programs

VMI offers a number of exciting special programs that enhance the primary academic experiences provided in our majors and minors, demonstrating the Institute's full commitment to educating the whole man and woman. For more information about these and other special programs, please visit our website: *http://www.vmi.edu/specacadprog*.

Institute Honors Program.

The Institute Honors Program was developed to enrich the academic experience of VMI's outstanding cadets through activities that encourage an affinity for intellectual inquiry and develop the capacity for sophisticated engagement of issues and problems, whether ethical, civic, or professional. In all of its elements, the program stresses peer leadership, strong oral and written communication skills, and the highest standards of academic integrity and excellence. The Institute Honors Program recognizes a broader range of achievement than honors earned in a particular major. Attainment of Institute Honors is viewed as the highest academic achievement at VMI. The program is open by application to any cadet with a 3.5 or higher GPA. For further information about the program, see the Associate Dean for Academic Affairs, 210 Smith Hall.

VMI Center for Undergraduate Research.

The VMI Center for Undergraduate Research (VCUR) is both a program and a centralized office with the mission of promoting and facilitating faculty-mentored undergraduate research and fostering the development of a culture of undergraduate research at VMI. VCUR operates on the premise that some of the most enduring meaningful academic experiences of college students come through opportunities to be mentored one-on-one by faculty outside the classroom, while also believing in the merit of research and other inquiry-based experiences within a more traditional classroom setting. VCUR simultaneously nurtures existing mentoring efforts and coordinates new institutional support for joint investigative projects by faculty members and cadets. Programs include an annual Undergraduate Research Symposium held on Post; the Summer Undergraduate Research Institute; cadet travel grants to present at professional meetings or conduct research in the field; and the Wetmore Fund for supplies for cadet academic year research. For more information, contact the Director for Undergraduate Research, 300 Preston Library.

Institute Writing Program.

The Institute Writing Program seeks to equip cadets for both academic success and participation in the full range of rhetorical occasions they will encounter in their lives as citizens and professionals. The program links three important components of the VMI curriculum: our rigorous core curriculum sequence in first-year composition (ERH 101 and ERH 102); a thriving Writing Across the Curriculum initiative, which requires cadets to complete two additional "writing-intensive" courses prior to graduation; and an interdisciplinary minor in writing for those who wish to pursue advanced training in rhetoric, technical, professional, or creative writing. Cadets' study in the writing curriculum is enhanced by consultants in the VMI Writing Center, who consult individually with cadets at any stage of a writing project. The program sponsors annual writing contests for cadets, local workshops, a nationally regarded symposium for professors of rhetoric and composition, and several presentations on Post each year featuring writers in all genres. For more information, see the Institute Director of Writing, 232 Scott Shipp Hall.

International Programs

Preparing young men and women for successful service in a world of rapidly integrating cultures and interdependent economies is an inherent component of Virginia Military Institute's mission of educating citizen-soldiers. The VMI Office of International Programs is tasked with the establishment, promotion, and administration of international programs for cadets. Programs offered to cadets fall into a number of categories: international military academy exchange programs, semester abroad programs, summer abroad programs, international internships, and cultural exchanges and study tours. For more information, please contact the Office of International Programs in Old Hospital, Room 101.

Internship Program

VMI works actively to assist cadets in any major who seek internship experiences that will allow them to apply/test career interests and demonstrate their abilities to prospective employers. Internships are available in all geographic areas of the United States. Some are eligible for academic credit, and many of them include stipends for work completed. For more information, contact the Office of Career Services, 311 Carroll Hall.

Summer Session

The VMI Summer Session facilitates cadet progression toward degree completion by offering courses for academic credit during the summer, consistent with the Academic Program Mission. The program is designed to enhance cadet retention, to optimize graduation rates, to provide opportunities for cadets to enrich their education, and to enable cadets to attend the Summer Session and also attend ROTC summer camps, engage in internships, and earn income. It provides the opportunity for cadets to meet curricular, scholarship, athletic, or readmission standards, by enabling them to earn credit for subjects in which they stand deficient or by receiving credit for courses in advance of their class. Summer study allows cadets to broaden their education by earning a double major or minor and facilitates transfer from one curriculum to another. In addition to traditional course offerings, the Summer Session also coordinates with the Summer Undergraduate Research Institute, the Summer Study Abroad Program, and the Summer Transition Program to offer a variety of academic opportunities. VMI cadets, graduates of accredited secondary schools, and students in good standing at other colleges may attend. For details about scheduling and other admission requirements, please contact the Director of the Summer Session, 301 Shell Hall.

Academic Support

VMI offers proactive and innovative programs of academic support for cadets at all levels.

Advising

According to the Council for the Advancement of Standards in Higher Education, "Academic advising is an essential element of a student's collegiate experience."

The mission of the Institute Academic Advising Program is to guide cadets through the exploration and clarification of their academic, career and life goals to help them develop skills and strategies that will contribute to their academic success and enable them to achieve a balanced engagement in co-curricular and academic activities. Faculty advisors both support and challenge cadets in an effort to increase each cadet's confidence and self-sufficiency until graduation.

Upon entry into VMI, each cadet is assigned a faculty advisor who, unless the cadet subsequently changes academic major, will work with the cadet until graduation. During the first year there is extensive contact between the advisor and cadet in order to facilitate the transition into VMI culture, assist in mastering the academic policies and regulations, and assist the cadet in coordinating the demands of a multi-faceted academic and co-curricular experience. Upper class cadets have one mandatory contact with advisors each semester but are strongly encouraged to meet with advisors more often in order to benefit from their field-specific expertise, life experience and curriculum knowledge. VMI also sponsors the Cadet Athlete Development Program to help scholar-athletes keep their focus on academics.

For information about the VMI Academic Advising Program, contact the Miller Academic Center at 540-464-7661, 202 Carroll Hall.

Career Services

The Office of Career Services provides a wide array of career planning, employment, internship and graduate/professional school services. Centralized career planning services include career exploration and decision making, career information, vocational interest assessment and career related programs. Employment services include job search guidance, resume assistance, interview skills training, employer information and recruitment programs. Graduate education support includes information on graduate/professional school admissions testing.

Center for Cadet Counseling

The Center for Cadet Counseling (CCC) offers a range of services designed to develop awareness, values, knowledge and skills necessary for Cadets to make healthy choices, meet future challenges and lead meaningful lives. Services include educational programming, individual assessment and counseling, psychiatric services, crisis intervention and consultation. Counseling services are confidential and conducted by licensed mental health professionals. Health and wellness programs are provided throughout the academic year on topics such as building psychological resilience, maintaining emotional wellness, stress management, substance abuse prevention, nutrition, sleep hygiene and healthy relationships. For more information, please call 540-464-7667; 2nd Floor VMI Health Center or visit our website: *http://www.vmi.edu/counseling*.

Office of Disabilities Services

The Office of Disabilities Services (ODS) is committed to meeting the ethical and legal responsibilities to ensure equitable educational access for cadets with documented disabilities. We support cadets' personal growth and development of academic, life and leadership skills in a manner that encourages self-awareness, self-determination, and self-advocacy. ODS also serves as a resource to the VMI community by promoting awareness and understanding regarding disability issues in higher education.

Cadets with documented disabilities are encouraged to schedule a meeting with the Director of ODS as early as possible to allow adequate time for review of

documentation, to allow for a thorough assessment of academic needs, and to familiarize new cadets with administrative procedures.

For more information, please call (540-464-7667); 2nd Floor VMI Health Center or visit our website: *www.vmi.edu/ds*.

Information Technology

The mission of VMI Information Technology is to serve and support the technology needs of the Institute and facilitate creativity in teaching, learning, and communication for cadets, administration, faculty and staff. VMI IT provides many services for cadets, including computer labs, hardware and software recommendations and installations, and help desk support. VMI IT is responsible for the VMI network, and can provide access upon request. For more information, please contact the VMI IT Help Desk, *help@vmi.edu*, 315 Nichols Engineering Building.

Mathematics Education Resource Center (MERC)

The primary goals of the MERC are to formulate a comprehensive picture of the mathematical lives of cadets, and then provide the support necessary to reinforce that picture. In this, MERC staff assesses what mathematical skills and experiences a VMI cadet has prior to admission. The MERC staff then strives to understand what expectations military, community, and private businesses have with regards to the mathematical skills and mathematical reasoning of a graduating cadet. Finally, in this knowledge of where a cadet starts and where they will go next, the MERC staff provides every possible means to support that cadet's exciting journey through VMI.

The primary resource for service of the cadet corps' mathematical needs is the Open Mathematics Lab (OML). Its design allows cadets to freely seek and find as much help as needed for any of VMI's mathematics core curriculum courses and pre-calculus, differential equations, matrix algebra, and multivariable calculus courses. The model for the lab is one wherein tutors are prepared to help cadets in an open and shared setting, where no appointments are necessary. OML tutors are trained, knowledgeable, and current on the specific techniques and problems taught by VMI mathematics teaching faculty. The OML is meant to complement and support, but not replace, course activities within the VMI mathematics curriculum.

Miller Academic Center

The Miller Academic Center facilitates cadets' academic success and timely progress toward a degree.

- Coordinates course-specific group study sessions.
- Develops and delivers academic support programs based on faculty and cadet input. Programs are delivered during Academic Saturdays and Dean's Times.
- Identifies and coordinates need-specific learning skills programs to be offered to the Corps, training times will include Dean's Training Times and Academic Saturdays.
- Provides advisors the information and training necessary for them to guide their advisees.
- Serves as Dean's representative to the S2 by meeting regularly to train and coordinate with them as they lead their peers in learning and support programs.

Miller Academic Center coordinates programs and services to facilitate cadet's achievement of optimal academic success. The MAC collaborates with both faculty and cadets to ensure that services address the needs of the Institute. Cadets may also meet individually with staff to discuss questions or concerns about academic success at VMI.

The MAC is located at 202 Carroll Hall. For more information, please visit *http://www.vmi.edu/mac* or contact us at 540-464-7661 or *mac@vmi.edu*.

Preston Library

The mission of Preston Library is to provide library materials and services of the highest quality; to teach skills needed for academic inquiry and lifelong learning; to support faculty and undergraduate research; to provide access to and promote the use of Institute historical materials; and to offer library services to the community at large.

Named for Colonel J. T. L. Preston, the library was dedicated in 1939, enlarged in 1972, and renovated in 1996. A second renovation will be completed in 2020. Preston Library offers a variety of individual and collaborative study areas throughout the building. There are two conference rooms with presentation capability and a library instruction room. Wireless network access and wireless printing are available throughout the building. The building is open to cadets 113 hours per week during the academic term.

Instruction in locating and evaluating research materials and in using research ethically are offered by Preston Library's librarians, who provide support face-to-face and virtually through an online chat service and via email. Librarians also create individual web guides for individual courses or for materials in a specific discipline, which are available through the library's website. Course-associated instruction may be requested by faculty in any discipline, or assistance may be requested individually by cadets.

Collections consist of approximately 280,000 print volumes, over 170 print journals, and approximately 58,000 government documents. The Library provides access to more than 200,000 ebooks, more than 50,000 full-text electronic journals and newspapers, and over 100 licensed electronic research databases and resources. The library's electronic journals and books can be accessed online anywhere on Post as well as remotely off Post by current VMI cadets, faculty, and staff. The Library also holds unique historical source materials in its Archives, and cadets are encouraged to visit the Archives to use and learn more about these primary research resources. Many historical collections in the Archives have also been digitized and can be viewed online through the library's website.

Preston Library is a member of the Virtual Library of Virginia (VIVA), a consortium of more than 70 academic libraries in Virginia which offers expedited interlibrary loan service among its members. Cadets can borrow materials on a walk-in basis from more than 40 VIVA member libraries, including the libraries at nearby Washington and Lee University. Preston Library also borrows materials from libraries outside of Virginia on behalf of cadets and faculty when needed; cadets, faculty, and staff of VMI are not charged for interlibrary loan service.

Writing Center

The VMI Writing Center helps cadets with a full range of activities to improve their writing, at any level and in any discipline. Professional and trained peer tutors, work with cadets in one-on-one conferences on every aspect of the writing process, from planning a paper to finishing the final draft. Tutors are available by appointment or on a walk-in basis in Carroll Hall.

Academic Policies

Academic Regulations

The VMI Academic Regulations are maintained by the Office of the Deputy Superintendent and Dean of the Faculty online at *http://www.vmi.edu/academics/dean-of-the-faculty/registrar/institutional-information/*. Among other information, the regulations include current VMI definitions and policies on:

- Academic Delinquency
- Academic Probation
- Academic Recognition
- Admissions Requirements
- Advanced Placement Credit
- Auditing of Courses
- Change of Grade
- Change of Major
- Class Attendance
- Classification (academic)

» Course Load
» Drop-Add Period
» Final Examinations
» Grade Reporting
» Grading System
» Graduation Requirements
» Readmission
» Repeating Courses
» ROTC
» Students with Disabilities
» Substitution of Curricular Requirements
» Transcripts
» Transfer Credit
» Withdrawals
» Work-for-Grade Policies

Please contact the Assistant Dean for Administration and Planning, 210 Smith Hall, if you have questions about the VMI Academic Regulations.

Academic Administration

The Academic Program is directed by the Deputy Superintendent for Academics and Dean of the Faculty, whose principal subordinates are the Associate Dean for Academic Affairs; the Assistant Dean for Planning and Administration; the Registrar; the Head Librarian; the Directors of Career Services, Center for Undergraduate Research, Institute Writing Program, International Programs, Math Education and Resources Center, Miller Academic Center, Sponsored Programs and Teacher Education Program, in addition to the heads of the Institute's seventeen academic departments. The Deputy Superintendent for Academics and Dean of the Faculty's Office is located in 210 Smith Hall. For contact information, see *https://www.vmi.edu/about/governance/administration/dean/*.

Current Academic Requirements

Annually each fall, the Registrar publishes the current academic requirements, including minimum academic standards. The standards are available online at *http://www.vmi.edu/academics/dean-of-the-faculty/registrar/institutional-information/*.

Work for Grade

Principles of academic integrity in all work for grade are stressed in every course taught at VMI. Cadets and faculty alike are reminded of the institutional statements and definitions regarding work for grade as expressed in the Academic Regulations. Work for grade policies are printed in the syllabus of every course taught at VMI.

Written Work

Every cadet is expected to use the English language clearly, correctly, and thoughtfully. Any cadet who through carelessness, indifference, or lack of preparation submits substandard written work in any course should expect to receive a reduced grade. Extremely poor writing may result in a failing grade. A cadet whose command of English is deemed inadequate may be required by his/her curriculum head to submit additional written work in order to earn a degree from the Virginia Military Institute.

The Co-Curricular Program

The distinctive VMI approach to higher education, which is the result of over 170 years of development, continues to prove its effectiveness in providing young men and women an environment that fosters intellectual, physical, and character development. The unique cadet lifestyle and all non-academic activities comprise the co-curricular program. Cadets live within a military framework; they wear the cadet uniform; they live in Barracks, and eat their meals in a dining facility. Because military training is combined at the Institute with a demanding academic program, cadet life requires much of the individual. For cadets to fully achieve their educational goals, it is essential that cadets willingly accept the military way of life found at the Institute.

VMI's mission is to produce "citizen-soldiers," men and women educated for civilian life and also prepared to serve their country in the Armed Forces. Historically about 20 percent of VMI graduates have made the military a career. However, approximately 50 percent are commissioned each year upon graduation. Cadets must take four years of ROTC instruction and are encouraged to take a commission in the service of their choice, but commissioning is not mandatory.

STUDENT GOVERNMENT

The General Committee

One of the three major agencies of student government is the General Committee, composed of officers of the three upper classes, elected by their classmates and a secretary chosen by the 1st class officers. This body enforces rules that govern the conduct of the Corps and grants increasing privileges to classes as they advance in seniority. The administration recognizes the General Committee and class officers as official representatives of the Corps and their separate classes, and it extends to them wide authority in self-government.

The Honor Court

The heart of VMI's student government is the honor system. Although honor, like many idealistic concepts, defies exact definition, it clearly refers to relationships which govern society and which yield to the members of that society immediate and tangible benefits. The honor system at VMI is not so much a set of rules—although rules are published and distributed to every cadet—as it is a way of living. Lying, cheating, stealing, or tolerating those who do are considered violations of the Honor Code. A cadet's statement in any controversy is accepted without question as truthful; examinations are not proctored; all work for grade must contain a "Help Received" statement reminding cadets to reflect on the assignment and to acknowledge any help received or the fact that no help was received in completing it.

The Corps as a whole has always been the guardian of its own honor, and its honor is its most cherished possession. To administer the system, the Corps elects an Honor Court. Any suspected violation is reported to this Honor Court, which conducts an investigation of the circumstances. An accused cadet may admit guilt and leave the Institute or may request trial. If found guilty, the cadet is dishonorably dismissed. If the accused is acquitted, the case is closed, and all records pertaining to the case are destroyed.

The Cadet Regiment

The third major agency of student government at VMI is the Cadet Regiment, made up of two battalions of five rifle companies each including the regimental band. The basic structure of the corps is that of an infantry unit, and all cadets drill as infantry troops under their own leaders. On the basis of demonstrated qualities of leadership and proficiency in military and academic studies, cadets are appointed to non-commissioned and commissioned cadet rank. The First Captain, as the highest-ranking cadet, commands the regiment. A major share of the administration of the Corps of Cadets is entrusted to cadet officers and their staffs.

Barracks Life

The Barracks is the focal point of a cadet's life at VMI, and the fact that all cadets are required to live under one roof facilitates student government and helps promote and strengthen ties of friendship. Rooms are furnished sparingly but with essential equipment, and three, four, five or six cadets share a room. They have equal responsibility for keeping the room clean and in order for daily inspection.

Personal items authorized in cadet rooms vary by class. For example, only first class cadets may keep civilian clothes in their rooms. New cadets until the completion of the Ratline may not keep electrical equipment, such as razors, radios and videogame systems. If personal items are brought to VMI and found to be unauthorized, limited storage space for these items is provided until such time as they are authorized.

Military System

The military system characterizes and distinguishes life at VMI. It fosters punctuality, order, discipline, courtesy, and respect for authority. By placing all cadets on a uniform plane, it enables them to advance through self-reliance, initiative, and strength of character.

The combination of military and academic training constitutes a strenuous program requiring diligent application and conscientious attention to both academic and military duties. For a cadet to derive the greatest benefit from what is admittedly a heavy program, absences from the post and from Lexington are limited.

The military system of administration of the cadet corps extends wide authority to individuals and holds all responsible for faithful exercise of assigned duties. The characteristic dependability of the VMI graduate results from life within this framework of authority and responsibility.

Although they have some features in common, the military system should not be confused with the system of new cadet orientation, which is briefly described below.

The New Cadet System

One of the Institute's oldest traditions is the system of initiation applied to new cadets by old cadets, who themselves have successfully completed it. Regardless of background or prior academic training, every cadet in the first year at VMI is a "rat" and must live under the "rat" system. Among its purposes are to teach or promote the following in the shortest span of time possible:

1. Excellence in all things, particularly academics.
2. Military bearing, discipline, and conduct.
3. Self-control, humility, and self-restraint.
4. Respect for authority and the forms of military courtesy.
5. Habits of neatness, cleanliness, orderliness, punctuality, and the importance of attention to detail.
6. The history and traditions of VMI and cadet life.
7. Class unity and the "brother rat" spirit that result from shared experiences in a stern and challenging environment.
8. A common understanding of civility, respect for others, and the importance of working together toward a common goal or mission.

The system is equal and impersonal in its application, tending to remove wealth and former station in life as factors in one's standing as a cadet, and ensuring equal opportunity for all to advance by personal effort and to enjoy those rewards that are earned. Throughout most of the "rat year," the new cadet walks at rigid attention a prescribed route inside barracks known as the "rat line," and double-time up and down barracks stairs. The cadet must be meticulous in keeping shoes shined, uniform spotless, hair cut, and in daily personal grooming. The new cadet must memorize school songs, yells, and other information.

Absences From Duty

Although provisions are made for recreation and necessary absence, justice cannot be done to studies or to military obligations if these absences are frequent or long. Saturday afternoons and Sundays are usually free of scheduled activities, given that a cadet has not incurred restrictions. There are also opportunities during the week for afternoon visits to town. The summer, Thanksgiving, winter, and spring furloughs compare with similar vacation periods at other colleges, and should be used for such purposes as medical and dental appointments, when needed. During the second semester of the freshman year, a new cadet is allowed a weekend furlough, the number of such furloughs increase as the cadet advances toward the first class. Athletic teams make trips to participate in games, and publications staffs are granted absences to conduct their business. Cadets who make the Dean's Honor List are eligible for special furloughs, academic days, and first class cadets may make a limited number of trips to be interviewed by prospective employers and to visit their homes for personal matters.

In addition to leaves of absence mentioned above, emergency leaves are allowed for the following reasons:

» Deaths in the immediate family.
» Urgent medical treatment of a specialized nature that cannot be obtained in Lexington.
» Critical illness in the immediate family when the family physician requests the presence of the cadet at home.

Cadets and parents should realize that these rules are made and enforced for the benefit of the Corps as a whole and to improve the opportunities to learn. Therefore, parents should not ask permission for their son or daughter to be absent except as provided in the regulations, as absences disrupt academic work and cannot, in justice, be extended to one and denied another.

Activities

Athletics

For cadets of special athletic ability, a highly developed program of intercollegiate athletics is maintained. VMI is a member of the Big South Conference for most sports. All sports compete at the NCAA Division I level. Teams are fielded in baseball, basketball, men's and women's cross-country, football, lacrosse, men's and women's rifle, men's and women's soccer, men's and women's swimming, men's and women's indoor track, men's and women's outdoor track, women's water polo and wrestling. Every cadet is welcomed as a candidate for participation in any sport in which he/ she may be interested. All athletes must meet certain academic standards prior to participating in intercollegiate competition. Freshmen are certified by the NCAA Eligibility Center in accordance with NCAA Bylaw 14.3 prior to initial intercollegiate competition and then each semester thereafter by VMI in accordance with NCAA Bylaw 14.4. Upper-class cadet-athletes are similarly certified each semester by VMI.

Cadets who do not participate in varsity athletics are encouraged to participate in club sports or other athletic programs. Athletic competition develops the cadets physically and enhances their team building skills. This is an essential aspect of VMI's method of developing leadership in each of our cadets. Club sports compete with clubs at various colleges and universities throughout the country and fall under the guidance of the Deputy Commandant.

Rat Challenge

"Rat Challenge" is an outdoor experiential program designed, organized, and supervised by the VMI Department of Physical Education.

The program is designed to foster self-confidence and physical conditioning in new cadets by creating training situations, stressful enough to demonstrate that they are capable of performing tasks, which surpass their previously self-imposed mental and physical limits. New cadets can expect to run distances (as much as 5 miles), conduct a forced march up a mountain, fight with pugil sticks, make a high-level entry into water, negotiate a number of group and individual obstacles, run two obstacle courses, and rock climb and rappel (approximately 150 feet).

The day-to-day operation of the program is administered by upperclass cadets (cadre) in order to provide opportunities in leading and teaching activities, which have calculated elements of risk, making safety and professionalism paramount. Many of the activities are derivatives of "Outward Bound" and various military training programs.

Participation in "Rat Challenge" is mandatory during the fall semester for all new cadets not involved in intercollegiate athletics. The program is conducted twice a week from 4 p.m. to 6 p.m. during the fall semester.

Cadet Publications

Cadets write, edit, and manage the following periodic publications:

The Bomb, yearbook established in 1885 as the first college annual in the South.
The Cadet, weekly newspaper established in 1907.

Religious Services

The religious convictions of our students are respected regardless of one's faith preference. The religious freedom of all students is assured through the Chaplain's guardianship.

Numerous opportunities are provided to encourage and develop the faith of our cadets. A non-denominational Protestant chapel service is conducted each Sunday of the year. A Chapel fellowship of cadets, staff and faculty families, local college students and community members make up a vibrant congregation of people who are committed to one another and to God. Our families are committed to the growth and nurturing of cadets and they regularly invite our students to their homes. Bible Study groups meet weekly on campus and in town. Clubs such as the Navigators, Fellowship of Christian Athletes, Newman Club, Officer's Christian Fellowship and many others meet the spiritual needs of a number of our cadets.

More than a dozen churches and organizations in Lexington offer worship opportunities and many of them provide campus ministries. Our students are frequently adopted by local church families and cared for while they are away from home.

The Institute Chaplain is the liaison officer to the local churches and the point of contact for our students regarding concerns of a religious nature.

Societies

Active student chapters of professional, technical, and scientific societies as well as local societies are sponsored by the various departments to stimulate a serious and professional approach to studies. Programs are planned and conducted by cadets. Visiting speakers address the societies, and often cadets prepare and deliver papers. Participation in regional conferences may be included in the activities. The following societies function at the Institute:

- American Chemical Society
- American Society of Civil Engineers
- American Society of Mechanical Engineers
- Beta Beta Beta, the biology honor society
- Beta Gamma Sigma, an honor society in business
- Delta Phi Alpha, an honor society in German
- Engineering Society
- English Society
- Eta Kappa Nu, an honor society in electrical engineering
- Institute of Electrical and Electronic Engineers
- Omicron Delta Epsilon, an honor society in economics
- Omicron Delta Kappa, an honor society for leadership and academic excellence
- Phi Alpha Theta, an honor society in history
- Phi Eta Sigma, national scholastic honor society
- Phi Kappa Phi, an honor society in all academic fields
- Pi Delta Phi, an honor society in French
- Phi Sigma Iota, an honor society in modern languages
- Pre-Law Society
- Psi Chi Society, an honor society in psychology
- Sigma Delta Pi, an honor society in Spanish
- Sigma Pi Sigma, a national physics honor society
- Sigma Tau Delta, an honor society in English
- Society of Physics Students
- Tau Beta Pi, an honor society in engineering
- The Virginia History Society

Cadet Clubs and Organizations

The Commandant's Office manages over 50 cadet clubs, club sports and organizations at VMI. These include Civil War Roundtable, Timber Framers, College Republicans, College Democrats, Golf, Lacrosse, Women's & Men's Rugby, Running, Wrestling, Jiu Jitsu, Powerlifting, Triathlon, Trap & Skeet, Women's & Men's Volleyball, Pistol, Equestrian, Theater, Soaring, Fishing, Boxing, Ice Hockey, Soccer, Basketball, and Semper Fi Society. VMI is committed to providing opportunities for all cadets to participate in clubs, organizations, and extracurricular activities that will contribute to the total quality of cadet life.

Musical Organizations

Opportunities are plentiful for cadets with musical interests, both as participants and as listeners.

The Regimental Band organized into its own company of 152 cadets within the Corps and provides music for ceremonies on Post as well as for athletic events. It has an impressive record of award winning performances across the state, country, and abroad. Recent appearances include the 2016 and 2008 Tournament of Roses Parade in Pasadena, California, Presidential Inaugural Parades, the Macy's Day Parade and the St. Patrick's Day Parade in New York City, and 14 Mardi Gras appearances in New Orleans, Louisiana. Within the band are smaller units such as the Pep Band, the Institute Brass Ensemble, the VMI String Ensemble, Paid Cadet buglers, the Herald Trumpets, and the VMI Drummers.

The VMI Commanders Jazz Band is a 16 piece jazz ensemble with a rich history of performances and are a popular musical outlet for gifted cadets. Formed in 1917 this unit performs at several concerts and dances annually. Since 1997 the band has traveled to Germany, France, and England.

The VMI Pipe Band provides music for ceremonies on Post and receive frequent requests to perform at special events throughout the United States. Cadets are taught to play the bagpipes or specialized drum techniques by a world-class bagpipe instructor. The unit is composed of approximately 45 cadets from all classes.

The VMI Glee Club presents concerts on Post and throughout the eastern United States. They appear on telecasts, tape cassette and CD albums, and in concerts at alumni gatherings and at various colleges; within the club is a small select group, The Sentinels.

Social Events

The Regimental S-7 is responsible for the Corps' social events such as movie nights, concerts and mixers. The Deputy Commandant also oversees many social events throughout the year to include the Midwinter Formal, Ring Figure Weekend, Homecoming Hop, the Cadet Ski Trip, and Trick or Treat in the Barracks.

Prizes, Medals, and Awards

Academic Awards

The Lieutenant General Edward Mallory Almond '15 Award for Academic-Athletic-Military Excellence. Established by the General John H. Forney Historical Society of Alabama in 1981 as a memorial to General Almond. Given annually to a graduating cadet who has made outstanding contributions to VMI's intercollegiate athletic program while distinguishing himself through academic achievement and soldierly bearing and aptitude.

The Stewart W. Anderson Award. Established in 1977 by gifts of relatives and former students to provide a certificate and cash prize to be presented to the graduate having a superior academic performance in the electrical engineering curriculum. The award is in honor of Brigadier General Stewart Wise Anderson, Class of 1908, to recall his 46 years of devoted service to VMI as a member of the faculty. He was head of the Department of Electrical Engineering for 21 years and Dean of the Faculty for 14 years.

John Randolph Tucker Carmichael Award. Established in 1951 by the Class of 1931 as a memorial to their classmate, Dr. John Randolph Tucker Carmichael, who died in 1941. The award, based upon unusual academic achievement and excellence of character, is made to a third class biology major.

The Society of the Cincinnati Medal. In 1913 the Society of the Cincinnati in the State of Virginia established a fund to provide annually a medal to be awarded by the faculty to the member of the graduating class most distinguished by efficiency of services and excellence of character throughout his/her cadetship.

The Company Cup. Established in 1970, an award to the company with the highest combined average GPA for the fall and spring semesters upon which their company and year is engraved.

Civil Engineering Award. A cash award to the graduating civil engineering major who is declared by the department head to hold the highest academic standing at graduation.

The Class of 1941 Award. An award to the first-standing second classman majoring in civil engineering, established by Colonel Alvin F. Meyer, '41.

The Major General Richard C. Coupland '15 Electrical Engineering Awards. Established in 1991, and awarded to a second and third classman, majoring in electrical engineering, who have demonstrated academic excellence, outstanding leadership abilities, and high moral standards.

The Dearing Medal. Established as a memorial to her son, Asa S. Dearing, Class of 1891, by Mrs. P. M. Dearing, the Dearing Medal is awarded annually to the member of the graduating class who has demonstrated the highest proficiency in the study of English and English literature.

Colonel Herbert Nash Dillard '34, Memorial Award. Established in 1977 in memory of Colonel Herbert Nash Dillard '34, senior professor of English, department head for eight years, director of the VMI Glee Club for twenty years, and a member of the VMI faculty for thirty-eight years. The cash award and certificate are to be presented to a member of the graduating class judged by the faculty and staff as the cadet best emulating the scholarship and dedication to a broad liberal arts education which characterized Col. Dillard. Consideration will be given to proficiency in a chosen field of study, leadership in the Corps of Cadets, and outstanding accomplishments in the extracurricular program of the Institute.

United Daughters of the Confederacy Sir Moses Ezekiel Award. This award is given to a cadet who has contributed to the cultural life of the Institute.

Faculty Scholorships for Merit. Recognize academic excellence in engineering, arts and humanities, social sciences, and natural sciences and mathematics. The awards are funded solely through contributions by retired and current members of the VMI faculty.

The John H. French Medal. Dr. John H. French, of New York, Class of 1879, gave to the Institute a sum of money which provides a medal for the member of the graduating class for highest proficiency in mathematics.

The Leslie German Second Class Award. A cash prize to a second class chemistry major for excellence in the study of analytical chemistry. This award was established in 1973 by an anonymous donor in honor of Colonel Leslie German who served on the faculty for thirty-five years until his retirement in 1968. Colonel German was head of the Chemistry Department for twenty-eight years.

Bruce C. Gottwald, Jr. '81 Award. Presented to the graduating Psychology major who has demonstrated the highest achievement in scholarship, service, and scientific inquiry.

Floyd D. Gottwald, Jr '43 Award in Chemistry. Given to the top standing Chemistry major.

John Bowie Gray 1867 Award. Established by the late Miss Aylmer Gray as a memorial to her father, a New Market Cadet. It is awarded to a third classman standing first in civil engineering.

Colonel Sterling Murray Heflin '16 Academic Proficiency Award. Established in 1988 as a cash prize awarded to the recipient of the Second Jackson-Hope Medal.

The Institute Honors Thesis Awards. Awards selected by the Institute Honors Committee and presented on behalf of the Institute Writing Program to the graduating cadets who present the most outstanding theses in satisfaction of the requirements for Institute Honors.

International Studies Award. Given to a graduating International Studies major who best exemplifies integrity, scholarship, and an abiding curiosity in international affairs.

The Larry L. Jackson '62 Undergraduate Research in Chemistry Award. Established in 1999 by Dr. Larry L. Jackson '62 and his wife, Lindy Lou White Jackson. A cash award presented to an upperclass cadet majoring in chemistry in order to reward past excellent performance in research and to encourage future research endeavors.

Jackson-Hope Medals. In 1867 the Honorable A. J. B. Beresford Hope, member of the British Parliament and representative of an association that had presented to the Commonwealth of Virginia a statue of Thomas J. Jackson, sent to Governor James L. Kemper the remainder of the statue fund, requesting that it be used for a further memorial to the great Confederate soldier. The Governor proposed and the Board of Visitors approved the establishment of two "Jackson-Hope Medals" to be presented annually to the two most distinguished graduates of the Institute, and since the first awards in 1877, the Jackson-Hope Medals have been VMI's highest awards for scholastic achievement.

The Stonewall Jackson Memorial Award. Established in 1957 by the United Daughters of the Confederacy to honor the great Confederate hero. The prize is presented annually to the first standing graduate in the physics curriculum. Philip H. Killey 1941 Award. Established in 1943 by the parents of Philip H. Killey, who lost his life in North Africa during World War II. The award, based upon unusual academic achievement and excellence of character, is made to a second class biology major.

Philip H. Killey 1941 Award. Established in 1943 by the parents of Philip H. Killey, who lost his life in North Africa during World War II. The award, based upon unusual academic achievement and excellence of character, is made to a second class biology major.

Alfred H. Knowles 1933 Award. Established by H. C. Knowles of Rochester, New York, in memory of his son, a member of the Class of 1933, who died as the result of an accident at home on Christmas furlough during his senior year. This award, based upon class standing, is made to a graduating biology major.

The Colonel Robert H. Knox Prize. Memorial prize established in 1985 by the family of Colonel Robert H. Knox, VMI class of 1924, who taught mathematics at VMI for 42 years until his retirement in 1969. Awarded annually to a member of the third class selected by the faculty of the mathematics department as the most promising mathematics major of that class.

The Richard Driggs LeMay, Jr. Award. Established in 1978 as a memorial to Major R. D. LeMay, Jr., '62, helicopter pilot and officer in the Fourth Air Cavalry, First Infantry

Division. He was killed in action during his second tour of duty in Vietnam in September 1968. A cash prize is awarded to that cadet deemed most proficient in military history.

The Ralph Bowen Linville Award. Established in 1964 by Mrs. Linville as a memorial to her husband who served on the chemistry faculty from 1947 to 1957. Awarded for excellence to a new cadet majoring in chemistry.

The Sumter L. Lowry Award. The first winner of the Cincinnati Medal, Major General Sumter deLeon Lowry, Class of 1914, has donated a sum of money to the VMI Foundation, Inc., for the purpose of providing a further cash prize to the winner of the Cincinnati Medal.

George C. Marshall Citizen-Soldier Award. The award is given bi-annually to a first classman or rising first classman best modeling the attributes displayed by George C. Marshall as a cadet.

Marshall Award in History. The George C. Marshall Research Foundation offers outstanding history majors at VMI the opportunity to study and work at the Marshall Library. Marshall scholars, chosen by the Foundation on recommendation of the VMI History and Politics Department, do an honors research paper on a topic related to the holdings of the Marshall Library. They attend seminars, participate in Marshall Foundation conferences, and receive a stipend at the conclusion of their research activities.

The Richard J. Marshall Award. An admiring comrade of Major General Richard J. Marshall during World War II, R. C. Kramer of New York, has established a fund for a cash award to the winner of the Cincinnati Medal.

The Commander Harry Millard Mason Awards. Two cash awards established in 1981 in memory of Commander Harry Millard Mason by Mrs. Mason. The Academic Proficiency Award made annually to a graduating member of the first class who stands first academically in his/her class will accompany the First Jackson Hope Medal. The second award is made to the graduating first classman recommended by a review committee as the most militarily proficient cadet.

The Commodore Matthew Fontaine Maury Award. Established in 1985 by the Virginia Division of the United Daughters of the Confederacy in memory of the famed oceanographer and meteorologist, and former member of the VMI faculty, from 1868 until 1872. The award will be made annually to the first-ranking graduate in the mathematics curriculum.

Alvin F. Meyer Awards. For the first classman showing highest proficiency in the sanitary engineering courses, and to the second classman standing first in the civil engineering curriculum.

Paul R. Meyer Award. This award, based upon academic achievement, is given by Dr. Paul R. Meyer, Class of 1924, and is awarded each year to a fourth class biology major.

The Superintendent William H. Milton, Jr., Class of 1920 Award. Established by members of General Milton's family and members of the Class of 1920. The award, a cash prize, is presented annually to the firststanding cadet in each class in the mechanical engineering curriculum.

Nathaniel W. Pendleton '22 Award. Established by Nathaniel W. Pendleton, Jr. '57, of Wytheville, Virginia, in memory of his father. The award is a cash prize and certificate to the first classman standing first in the civil engineering curriculum during his/her first class year.

John Robert Philpott Medal. Established in honor of Mr. Philpott, Class of 1935, to acknowledge his efforts as National Chairman of the Economics Fund Drive which resulted in establishment of the Mary Moody Northen Distinguished Scholars Chair in the Arts and Social Sciences. The medal recognizes outstanding performance in research by an Economics and Business major in the graduating class.

Adolfo Ponzanelli Medal. Established in honor of Adolfo Ponzanelli, a native of Mexico, member of the Class of 1932, for outstanding service to and lifelong interest in the Institute. The medal is awarded in recognition of excellence in the study of modern languages by a modern language major in the graduating class. The initial award was made at Finals 1972.

The Herbert E. Ritchey First Class Award. Established in 1972 by alumni and friends of Colonel Herbert E. Ritchey who served on the VMI chemistry faculty for thirty-eight years until his death in 1970. Awarded for excellence in the study of organic chemistry to a graduate who is receiving a degree in chemistry or biology. The award consists of a medal and a cash prize.

The Herbert E. Ritchey Third Class Award. A cash prize to a third class chemistry major for excellence in the study of organic chemistry. This award was established in 1973 by an anonymous donor in memory of Colonel Herbert E. Ritchey who served on the faculty for thirty-eight years until his death in 1970.

The Roberts Medal. Established in honor of John W. and Jane M. Roberts to recognize their lifelong interest in the American free enterprise system and their unswerving support for the Department of Economics and Business. The medal recognizes outstanding performance by an Economics and Business major in the graduating class.

The Sauder Physics Award. Established in 1999 by the Physics and Astronomy Department as a memorial to William Conrad Sauder, Class of 1955, for his lifelong excellence in teaching and research at the Institute.

The Jeff Shaara Scholar-in-Residence Award. Established in 1999. Annual award to provide the opportunity to pursue a research topic relating to mid-nineteenth century American history and to serve as a historical interpreter at New Market Battlefield State Historical Park. The Shaara scholar will receive a $2,500 cash stipend, a ten-week appointment to the New Market Park staff, and summer lodging on the historic Bushong Farm.

The Francis H. Smith Award. A cash award established in 1981 by an anonymous donor as a memorial to Francis H. Smith, VMI's first Superintendent, is made to a rising first classman who has exhibited outstanding academic achievement, extracurricular participation, leadership ability, and demonstrated potential for a professional career.

James Preston Taylor 1945 Award. Established in 1959 by Robert L. Wallace, Class of 1924, as a memorial to his nephew who was killed in action on Iwo Jima in World War II while serving in the U.S. Marine Corps. The award is made to a fourth classman majoring in civil engineering.

The Randolph T. Townsend Award. In 1951 Mrs. Randolph T. Townsend established the award as a memorial to her son, a member of the Class of 1950, who was killed in action in Korea in 1951. A bronze medal and a cash prize are presented annually to the first standing graduate in the history curriculum.

James Clifton Wheat, Jr. Medal. Established in honor of Mr. Wheat, Class of 1941, to acknowledge his lifelong interest in the economics and business studies at VMI, and his leadership in the VMI Foundation's Economic Fund Drive, 1969-70. The medal recognizes outstanding performance on the Major Field Test-Business by an Economics and Business major in the graduating class.

Commandant's Awards

Alan d'Andelot Belin Memorial Award. Given to a fourth Classman who has earned the respect of their Brother Rats and of the Corps of Cadet by performance within the Rat system. The award is an engraved mug.

The William Brent Bell '67 Award. Established in 1970 as a memorial to First Lieutenant Bell who was killed when his helicopter was shot down by enemy fire in Viet Nam in March 1969. It was established by his parents, relatives, classmates and friends to recognize a third class cadet who has shown excellence in military studies as did Lieutenant Bell while at VMI. The recipient receives a cash prize of $100 and an engraved saber.

The Gen. Burress Marksmanship Awards. The awards are $500 checks and engraved pen sets for the highest shooter (male and female) of the Corps. The 100th Infantry Division is funding these awards.

The John Ryd Bush Award. This award recognizes the fourth classman whose military character and proficiency are most noteworthy. It was established in 1944 by

William E. Bush as a memorial to his son, a member of the Class of 1946, who died in 1944 as a result of an accident while on Army duty during World War II.

The Commandant's Cup. Established in 1959, the Commandant's Cup is awarded "to the cadet company making the best score in certain aspects of physical training" to be given to the cadet company excelling in physical fitness activities for the academic year.

The Community Service Award. Established in 2012 by the Commandant of Cadets, Colonel Thomas H. Trumps, VMI Class of 1979, to recognize a cadet who served as an emergency medical technician, firefighter or rescue squad member. The recipient will receive a personally embroidered medical travel kit and $100.

The VMI Distinguished Third Class Leadership Award. Established by Nathaniel W. Pendleton, Junior, VMI Class of 1957, to encourage and recognize praiseworthy leadership in the proper practical education, training and development of fourth class cadets by members of the third class. It is given to a third class cadet who has participated as a member of the new cadet training cadre or rat challenge training cadre, and who has exhibited the most praiseworthy leadership. The award recipient will receive a cash prize of $250 and a collection of books on leadership.

The Lemuel MacKennie Long Jarman Award. Established in 1940 by Dr. F. G. Jarman in memory of his son, a member of the Class of 1943, who died as a result of an accident during equitation instruction, the award provides a cash prize for the member of the fourth class who has been most outstanding in scholarship, conduct, and character.

The 3rd Class Marksmanship Award. Established in 2012 by Commandant of Cadets, Colonel Thomas H. Trumps, VMI Class of 1979, to recognize the company highest scoring average with the M-16/AR-15 service rifle. The certificate of achievement is given to the company with the highest average score on the 25 meter alternate course "c" qualification target. Company scores will also count towards the overall Commandant's Cup Award. Third class cadets scoring 38-40 hits during the record qualification will receive the U.S. army expert rifle qualification badge.

The Association of Military Colleges and Schools of the United States Medal. Given to a graduating cadet who has demonstrated significant improvement in leadership skills.

Class of 1964 New Market Legacy Award. Presented to a Brother Rat of the graduating First Class whose cadetship in the opinion of his or her Brother Rats is most reflective of the character, honor, and spirit of the 1864 New Market Corps of Cadets.

The North Post Challenge Award. Established in 2012 by the Commandant of Cadets, Colonel Thomas H. Trumps, VMI Class of 1979, to recognize the company team with the highest combined fitness and marksmanship score. The award is given to the company team with the highest score in the following events: swimming, foot march, trap shoot, rifle marksmanship, rock climbing, obstacle course, and confidence climb. Company score will also count towards the overall Commandant's Cup Award. The first, second and third place company teams will also receive individual hand crafted sheath knives.

The VMI Physical Fitness Award. Established in 2012 by the Commandant of Cadets, Colonel Thomas H. Trumps, VMI Class of 1979, to recognize the male and female cadets achieving the highest VFT score during the academic year. Recipients will receive an engraved sports bottle and $100.

The Colonel Thomas H. Trumps '79 Award Given to a graduating first class private who has accepted an active duty commission in one of the Armed Forces and has demonstrated active participation in a leadership role in one of the VMI Club Sports. The recipient will receive a $500 check.

The Veteran's Recognition Award. Established in 2012 by the Commandant of Cadets, Colonel Thomas H. Trumps, VMI Class of 1979, to recognize a cadet who is a veteran of active duty military service and has continued to serve through exemplary leadership and mentorship in the Corps of Cadets. The recipient will receive an engraved mug and $100.

Military Awards

The Garnett Andrews Cup. Presented in 1915 by Garnett Andrews, Class of 1890, the Garnett Andrews Cup is awarded to the cadet company scoring highest throughout the session in drills, ceremonies, and general efficiency as a military unit.

The Garnett Andrews Prizes. Begun in 1915 by Garnett Andrews, Class of 1890, and continued since his death by his son and namesake who graduated from VMI in 1927, a first prize of $350 and a second prize of $150 are awarded to members of the graduating class who submit the best papers on a military subject, approved by the Commandant, and whose military records through their cadetships have been commendable.

Colonel Thomas St. John Arnold '35 Award. Established in 1987 by Colonel Thomas St. John Arnold '35, USA Retired, the award will be presented to a graduating first class private who is accepting a regular Army commission.

Colonel Earl L. Brown Award. Established in 1983 as a memorial to the former Commandant of Cadets at John Marshall High School in Richmond. Awarded to VMI's George C. Marshall ROTC Award recipient.

100th Infantry Division Lieutenant General Withers A. Burress Scholarship Fund Awards. These cash scholarships are presented to rising 1st Classmen and rising 2nd Classmen on the basis of scholarship, leadership, and military proficiency, in honor of the men of the 100th Infantry Division and their commander, Lieutenant General Withers A. Burress, VMI Class of 1914.

The Charles H. Dayhuff, Jr. '31 First Captain Award. An award given by the family of Colonel Charles H. Dayhuff, Jr. '31, to the First Captain in the Cadet Regiment.

Chief of Naval Operations Distinguished Midshipman Graduate Award. This award is presented to a cadet commissioning with the Navy who has demonstrated the highest academic excellence.

The Captain John W. Kennedy '69 Award. An award that goes to the outstanding VMI Air Force ROTC graduate. Captain Kennedy was a classic VMI man. He triumphed scholastically, athletically, and militarily. He was the last VMI graduate lost in the Vietnam War and his remains were repatriated in 1996.

Lieutenant John H. Lattin, Jr. '66 Award. Established in 1983 by the parents of Lt. John H. Lattin, Jr. '66, who was killed in action in Vietnam in December 1967. Awarded to the outstanding infantry graduate receiving an Army commission, and who had a distinguished military record during four years at VMI.

The Charles R. Martin '55 Award. As a memorial to Charles R. Martin who died in an automobile accident on the day of his graduation in June 1955, his parents have established a prize consisting of a silver tray which is awarded annually to the graduate accepting a commission in the armed forces who has demonstrated special excellence in military studies and outstanding leadership in the Corps of Cadets.

General Douglas MacArthur Cadet Award. This award is given to a cadet demonstrating the most soldierly performance by a 1st class cadet, considering academics, athletics, and leadership.

Chesty Puller Award, First Marine Division. Given to the commissioning first class Marine Option who exhibits the highest qualities of leadership.

Major General Stephen Sewell, Jr. '60 Award. A scholarship given to a 3rd or 4th year ROTC Scholarship recipient, in high standing with both VMI and the Army ROTC Department.

General Lemuel C. Shepherd, Jr. 6th Marine Division Awards. These awards are given to the top two Marine graduates in the Naval ROTC program at VMI.

The Superintendent's Cup. Established in 2010, the Superintendent's Cup is awarded to the company with the highest cumulative point total in the three scored areas of academics, military efficiency, and physical fitness.

The Earl L. Valentine, Jr., Award. Established in 1972 under the terms of the will of Judge E. L. Valentine of Lexington, Va. The award is a memorial to Judge Valentine's son, a member of the Class of 1949A who graduated from the U.S. Naval Academy in 1951. Lieutenant Valentine was mortally wounded in August 1952, while leading a platoon in the Korean War. The award is given annually to a graduating cadet who excels in leadership.

Brigadier General Alonzo J. Walter '49B Award. Presented to the most outstanding Air Force ROTC graduate.

Lieutenant Mark R. Wilson Midshipman Award. An award named in his son's honor, to recognize an outstanding 1st Class Navy ROTC Midshipman.

Athletic Awards

The Lieutenant General Edward Mallory Almond '15 Award for Academic-Athletic-Military Excellence. Established by the General John H. Forney Historical Society of Alabama in 1981 as a memorial to General Almond. Given annually to a graduating cadet who has made outstanding contributions to VMI's intercollegiate athletic program while distinguishing himself through academic achievement and soldierly bearing and aptitude.

The Intercollegiate Sports Award. Three recipients: The outstanding athlete among football, basketball, baseball, and men's track. The outstanding athlete among lacrosse, rifle, men's soccer, men's swimming, and wrestling. The outstanding athlete among women's sports.

The Frank Summers Team Leadership Award. Established in 1975 in memory of Francis L. (Frank) Summers, Class of 1922, who earned more VMI monograms than anyone in the Institute's history. Awarded to an athlete in the first class chosen by the Athletic Council as the outstanding team leader.

Institutional Information

Dismissal and Other Penalties

In the interest of good order and discipline, the Institute reserves the right to dismiss, suspend, or otherwise penalize any cadet who does not properly adapt to the life and work of the college. Among the offenses that are considered seriously subversive of high standards of character and conduct and, which may result in dismissal, are disobedience of orders, combinations against authority, hazing, uncivil or disorderly conduct, use or possession of alcoholic beverages within the limits of the Institute or in a way to bring discredit to the Corps, absence without leave, habitual neglect of academic or military duty, and unauthorized use of explosives. Any use or possession of unauthorized illegal drugs or unauthorized possession, distribution, or use of prescribed drugs is a dismissal offense. Any conviction of an honor violation is a dismissal offense.

Demerits, restriction to post limits, and penalty tours are assigned for infractions not so serious as to merit dismissal or suspension, and demerits alone are assigned for minor offenses. An excessive accumulation of demerits is regarded as failure or inability to adjust satisfactorily to the military requirements and may result in suspension or dismissal.

Transcripts of cadets dismissed for disciplinary reasons and transcripts of cadets dismissed for honor violations are correspondingly annotated.

Cadets dismissed for disciplinary reasons may petition to be readmitted after being absent from the Institute for one year.

Jeanne Clery Act

(Student Right to Know Information)

The Jeanne Clery Act requires all institutions of higher education to publicly disclose 3 years of campus crime statistics and basic security policies. In addition, federal regulations require disclosure of graduation rates for each institution (overall and for athletes). VMI has chosen to include its sexual harassment and sexual assault policies with this information.

Your personal safety and the security of the community are of vital concern to the Virginia Military Institute. A copy of the Institute's annual security report is available upon request. This report includes statistics for the most recent three-year period concerning reported crimes that occurred on post, in certain offpost buildings or property owned or controlled by VMI, and on the public property within, or immediately adjacent to and accessible from the post. The report also includes information regarding the law enforcement authority of the post police, policies concerning campus security, such as crime prevention, alcohol and drug use, sexual assault, domestic and dating violence, stalking, and reporting of any crimes which may occur on campus. You can obtain a copy of this report by contacting the Office of Communications and Marketing (540-464-7207), Smith Hall, Virginia Military Institute, Lexington, Virginia 24450-0304.

Health Services

An annual fee, included among the fixed fees listed elsewhere in this catalogue, provides for routine medical and psychological care. The Post Hospital houses the Office of Cadet Counseling and the VMI Infirmary. Counselors are available by appointment for a wide range of issues that college students confront. A physician and a nurse practitioner are available to attend to the medical needs of cadets. The infirmary is staffed by nurses who are on duty all the time while cadets are present during the fall and spring semesters. The infirmary allows for observation, isolation and treatment of routine illnesses and injuries. In case of serious illness, serious injury, or when surgery is required, arrangements are made for the necessary treatment off Post. Diagnostic tests or treatment which cannot be done at the VMI infirmary are not included in the annual fee and are the responsibility of the cadet. The Institute does not assume responsibility for the expense of caring for injuries sustained by students while training for or participating in intramural or club athletic events, the military program, clubs, or similar activities. VMI does provide accident insurance for cadets which will cover up to $5,000 for injuries incurred while participating in VMI sponsored and sanctioned activities. This insurance policy will be secondary to any medical coverage provided by families. VMI strongly recommends that cadets be covered by a primary insurance policy provided through their families or purchased from an insurance company independent of the Institute.

Loss of Personal Property

The Institute is not responsible for losses of uniforms, equipment, or personal property of cadets, either for items stored during furlough periods or lost during the regular session. The Institute recommends that a cadet's personal property be insured through extended coverage of the parent's or guardian's homeowners/tenant coverage.

Marriage and Parenthood

All VMI cadets must live in Barracks and participate in a demanding and rigorous military program that does not permit attention to the duties implied by marriage or parenthood. Pursuant to resolution by the Board of Visitors 25-January-2014, and General Order No. 7, dated 30-April-2014, any cadet who marries or incurs the responsibilities of parenthood is expected to resign from the Corps. Absent voluntary resignation, should the Institute, in its reasonable judgment, conclude that a cadet is married or has incurred the responsibilities of parenthood; such cadet shall be separated from the Corps, for failure of eligibility. For the purpose of this policy, the responsibilities of parenthood are deemed to begin upon the birth of a cadet's biological child for whom the cadet has custody, childcare responsibilities, or legal support obligations. A cadet who becomes pregnant can continue as a cadet until it is medically determined that she cannot fulfill the duties and meet the standards expected of a cadet. The cadet is then put on medical leave until fit to return to duty. Any cadet, male or female, who has incurred the responsibilities of parenthood must make legally sufficient arrangements for another individual to have temporary custody and legal guardianship of the child to qualify for readmission.

Motor Vehicles

Cadets are prohibited from owning, maintaining or operating motor vehicles in Lexington and Rockbridge County until the first class year. This regulation, like all others, was adopted for the good of the cadets, and parents must assist in its enforcement by not providing automobiles. Violation of this rule may result in penalty as prescribed by the Blue Book.

Student Records

FERPA/Student Records

The Family Educational Rights and Privacy Act (FERPA), 20 U.S.C. § 1232g; 34 CFR Part 99, protects the privacy of student education records, defined broadly to include all records maintained by an institution of higher education or an agency acting for such institution that are directly related to a student. Virginia Military Institute complies with the provisions of FERPA in maintaining cadet education records and responding to requests for disclosure of education records.

Student Rights:

Students have certain rights concerning education records maintained by VMI, including the following:

1. Students have the right to inspect and review their own education records maintained by the VMI. Copies of records will not be provided unless, for reasons such as great distance, it is impossible for students to review the records. A reasonable fee may be charged for copies.
2. Students have the right to request that VMI amend records which are believed to be inaccurate, misleading, or in violation of the student's privacy rights. If VMI determines that the record is inaccurate, misleading, or in violation of the student's privacy rights then VMI shall amend the record and inform the student in writing of the amendment. If VMI decides not to amend the record, the student then has the right to a formal hearing. After the hearing, if VMI still decides not to amend the record, the student has the right to place a statement with the record setting forth his or her view about the contested information or stating why he or she disagrees with VMI's determination, or both.
3. Students seeking to inspect or review education records or to seek amendment should contact the Registrar's Office.
4. Students have a right to consent to disclosure of personally identifiable information in the student's education record, subject to certain exemptions under FERPA authorizing disclosure without consent, as detailed below.
5. Cadets/students may obtain information regarding FERPA or may file a complaint with the U.S. Department of Education concerning VMI's compliance with FERPA by contacting the Family Policy Compliance Office at: Family Policy Compliance Office, U.S. Department of Education, 400 Maryland Avenue, SW, Washington, D.C. 20202-5920, Phone: 1-800-USA-LEARN (1-800-872-5327)

Disclosure of Educational Records

Education records may be disclosed if a student provides a written and specific release. A model format for such release may be obtained from the Registrar's Office. VMI also may disclose education records to the parents of students who have provided a specific release authorizing disclosure to parents.

VMI may disclose information from education records without the student's consent under certain circumstances detailed in FERPA including, but not limited to, the following:

- School officials with legitimate educational interest;
  "School officials" for purposes of this policy include, but are not necessarily limited to, faculty, administrative and professional staff, clerical personnel, members of the ROTC units acting in discharge of official duties, contractors to whom VMI has outsourced certain Institute services or functions, the VMI Alumni Agencies, and cadets acting in an official capacity in support of the VMI mission including Honor Court and cadet government members.
  "Legitimate educational interest" typically will be determined on a case-by-case basis. Generally, a legitimate educational interest will exist when the information is relevant and necessary for a VMI official to perform tasks within the scope of his or her job description in the context of official VMI business and the use is consistent with the purpose for which the information is maintained.
- Outside contracted or affiliated agencies performing functions in support of the VMI mission;
- Other post-secondary institutions to which a student is transferring or seeking transfer;
- Federal and state entities in connection with financial aid eligibility or awards, an audit or evaluation of federal or state-supported education programs, or for the enforcement of or compliance with federal legal requirements related to federal education programs;
- In accordance with a validly issued subpoena and after notice to the affected cadet;
- Specified officials for audit or evaluation purposes;
- Organizations conducting certain studies for or on behalf of VMI;
- Accrediting organizations, including the Southern Association of Colleges and Schools—Commission on Colleges;

» In connection with a health or safety emergency, including release of information regarding an act of sexual violence to local law enforcement as required by Va. Code § 23.1-806;
» Disclosure of the final results of a disciplinary proceeding for an offense of violence or a non-forcible sex offense in violation of the cadet rules of conduct ("Blue Book") or other VMI policy, to the victim of such offense;
» Criminal investigation records disclosed by the VMI Police to local law enforcement or the Virginia State Police;
» In connection with the Virginia Longitudinal Data System;
» Directory information.

Directory Information

"Directory information" is defined by VMI to include a cadet's name, home address, VMI box number, VMI email address, telephone number, photograph, date and place of birth, honors and awards, participation in VMI recognized activities and sports, weight and height of members of athletic teams, major field of study, ROTC unit affiliation and dates of attendance.

Other than cadet address, telephone number, and email address, directory information may be released by VMI unless a cadet specifically requests to "opt out" of directory information release before the end of the first week of the fall semester. Opt out requests must be made in writing to the Director of Communications and Marketing and remain in effect until rescinded by the cadet, including after graduation.

In accordance with Virginia Code § 23.1-405(C), VMI will not release pursuant to the FERPA directory information exception, 34 C.F.R. § 99.31(a)(11), cadet address, telephone number, or email address unless the cadet has affirmatively consented in writing to such disclosure. VMI will obtain written consent to include cadet address, telephone number, and email address in any directory searchable by the public or any VMI internal directory.

In accordance with Virginia Code § 2.2-3705.4(B), VMI will not release cadet address, phone number, or email address in response to a Freedom of Information Act (FOIA) request without written consent of the cadet. VMI reserves the right to deny requests for cadet directory information from any individual or entity external to the VMI community.

See General Order #9, Family Educational Rights and Privacy Act (FERPA) and Student Records Policy, for more detailed information on VMI's FERPA policies.

Record Updates

Cadets are responsible for keeping their personal records updated while enrolled. Cadet and parent home address changes and changes for emergency contacts must be reported immediately by the cadet to the VMI Registrar's Office. Address changes may not be made by telephone. Changes in health insurance should be reported to the VMI Hospital.

Reserve Officers Training Corps

At VMI the Department of Defense maintains Army, Naval, and Air Force Reserve Officers Training Corps (ROTC) units. Every cadet must take ROTC as an all-college program requirement for completion of their degree.

All cadets who desire to commission and otherwise meet Navy/Marine or Air Force ROTC eligibility criteria can enroll in those ROTC programs at VMI. Cadets who desire to commission in the Army, do not wish to commission, or who do not meet the criteria for the other services, will be enrolled in the Army ROTC Program. Cadets are encouraged to consult with the VMI ROTC detachments if they have questions, and are eligible to declare those ROTC designations upon approval from the appropriate unit.

All cadets who are citizens of the United States and who qualify physically, mentally, and morally are encouraged to contract with an ROTC unit. The length of the active duty and reserve status period varies with the personnel needs of the Department of Defense. VMI can make no guarantee of enrollment or of continuance in the ROTC as these matters are controlled by the Federal government.

Army

The mission of Army ROTC is to commission the future officer leadership of the U.S. Army and to motivate young people to be better citizens. Any cadet interested in developing leadership skills in a challenging environment will benefit from what Army ROTC has to offer. Those cadets who are committed to serving their county and who desire a career as a commissioned Army officer will find themselves well prepared by the top Army ROTC program in the nation. This four-year program is divided into a basic and an advanced course. The Basic Course, during a cadet's first two years, consists of instruction in the basics of teamwork, leadership, and exciting hands-on skills. The Advanced Course, for cadets in their last two years, focuses on practical group leadership and advanced military skills. Army ROTC is centered on leadership development, with individual feedback and counseling provided to each cadet. Cadets will learn in both classroom and field environments, and Army ROTC offers a Field Training Exercise each semester, designed to enhance cadets' confidence, teamwork, and leadership abilities. In addition, Army ROTC sponsors a number of extracurricular cadet clubs and activities, including the Cadet Battery, Ranger Company, and the Ranger Challenge competition. Cadets pursuing an Army commission are strongly encouraged to participate in these activities.

Qualified cadets are encouraged to contract with Army ROTC as a scholarship or non-scholarship cadet. Contracted cadets receive a monthly stipend of $300 during the freshman year, $350 as a sophomore, $450 as a junior, and $500 during the senior year. Contracting is the first step toward earning a commission as a second lieutenant in the U.S. Army.

In addition to eight semesters of Army ROTC, cadets pursuing a commission must complete a professional military educational requirement of one semester of U.S. military history. They must also succeed during the four-week Advanced Camp, which takes place during the summer between the junior and senior years. On a competitive basis, cadets may also attend other training during summer breaks. This training includes Army courses such as Airborne School, Air Assault School, The Mountain Warfare School, and Internships both at home and abroad. To be considered for this training, cadets must be intent on commissioning.

Army ROTC is a demanding program that requires commitment from each cadet. However, the rewards more than equal the effort. All cadets will benefit from a greater understanding of their country and its Army, and from practical, demonstrated leadership ability. Those cadets who choose to serve, upon successful completion of the program and graduation from VMI, will commission as a Second Lieutenant in the United States Army, Army Reserve, or Army National Guard.

Navy and Marine Corps

The Naval ROTC is a four-year course of instruction to provide cadets the opportunity to earn regular commissions in either the Navy or the Marine Corps. Cadets who enroll in the Naval ROTC will receive instruction leading to possible careers in the naval service in the air, on the land or at sea. Specifically, Navy-option cadets will receive instruction in naval history & traditions, naval ship systems/operations and management. Concurrently, Marine-option cadets will study Marine Corps history & traditions, the evolution of warfare, amphibious warfare, and will be introduced to the all elements of the Marine Air Ground Task Force. All cadets will receive instruction in management, leadership and ethics throughout their four years in the program.

The NROTC unit at VMI stresses the core values of honor, courage and commitment both in the classroom and through practical application designed to develop strong leadership skills. Activities outside the classroom include Navy and Marine Corps ceremonies and traditions, field training exercises and physical training. Two professional societies: Trident Society for Navy-option cadets and Semper Fi Society for Marine-option cadets, provide a forum for activities related specifically to each service. Field training exercises are dynamic events ranging from small unit tactics training at regional military bases to familiarization visits to operational ships and squadrons in the fleet.

A cadet may become an NROTC midshipman either by selection for a national NROTC scholarship before matriculation at VMI or by nomination and selection after matriculation for either the scholarship or for the NROTC College Program. 2-year and 3-year scholarship selectees incur a service commitment once they begin their junior or sophomore year, respectively. NROTC College Program cadets participate in NROTC classes and unit activities just like scholarship cadets. Advanced Standing College Program cadets do not receive scholarships but may receive monthly stipends of $350 during the junior year and $400 during the senior year. Graduation from VMI and completion of the Naval Science program can lead to a commission and service as a Navy or Marine Corps officer.

Air Force

The Air Force ROTC Program provides college-level education in order to qualify eligible cadets for commissioned service in the United States Air Force. The four-year program is offered in two distinct two-year courses: the General Military Course (GMC) and the Professional Officer Course (POC).

The GMC concentrates on basic Air Force organization and air power history. Eligible GMC cadets may compete for a commission and are evaluated based on academics, physical fitness, and motivation. The POC is designed to build leadership and professional qualities by concentrating on the principles of leadership, management, and national security policies. AFROTC also sponsors a variety of extracurricular activities designed to increase leadership and management training and orient cadets to the Air Force. Such activities include base visits, potential orientation flights, field training exercises and flight simulator visits.

Cadets may apply for career fields of their choice: such as pilot, combat systems officer, space operations, nuclear missile operations, research and development, and combat support. Entry into specific career fields depends on individual qualifications and the needs of the Air Force.

A continuing need for officers with all backgrounds results in attractive scholarship opportunities. Students who accept an AFROTC scholarship incur the same basic service obligation as their non-scholarship counterparts. Scholarships range from two to four years in length and may cover full or partial tuition, $600 towards books, and fees. AFROTC scholarships do not cover room and board or the VMI quartermaster charge.

Successful completion of the AFROTC program results in a commission as a second lieutenant in the United States Air Force. The service obligation for non-flying officers is four years of active duty. For pilots and combat systems officers, the service obligation is ten and six years, respectively, from completion of training. For more information visit: *http://www.afrotc.com*.

ROTC Scholarships

Four-year ROTC Scholarships are awarded to selected high school graduates on a national competitive basis. They are normally awarded by the services before matriculation at VMI; however, ROTC scholarships in college may become available for cadets based upon demonstrated performance, academic proficiency and motivation toward a service career. Details are available at each of the ROTC departments at VMI.

Application deadlines for these scholarship programs normally fall near the end of the first semester of the senior year in high school. Details may be obtained from the following sources:

Army: Commander
U.S. Army Cadet Command
Scholarship Processing Branch
Fort Knox, KY 40121-5123
(502) 624-7371
usarmy.knox.usacc.mbx.train2lead@mail.mil
www.armyrotc.com

Navy/Marine Corps: Naval Service Training Command
Officer Development
NAS Pensacola
Pensacola, FL 32508-5220
1-800-NAV-ROTC
www.nrotc.navy.mil

Air Force: HQ AFROTC/RRUC
Maxwell AFB, AL 36112-6106
www.afrotc.com
1-866-4AF-ROTC

There are numerous active duty and reserve forces duty on-campus scholarship opportunities for cadets enrolled in the Army ROTC program. Those interested cadets must meet minimum qualifying standards such as maintaining a 2.5 cumulative GPA, are United States citizens, and must be medically and physically qualified. These on-campus scholarships provide financial coverage for all cost minus room and board and the quartermaster fee, $1200 per semester for books, and a monthly stipend of up to $300-$500 per month during the academic year.

Naval ROTC also offers on-campus scholarship opportunities, specifically three and two year scholarship opportunities for qualified and recommended applicants. The general enrollment criteria are: Be a citizen of the United States, maintain at least a 2.5 grade point average on a 4.0 scale, be medically qualified, be not less than 17 years old and not yet 23 by 01 September of the year of enrollment and must not have reached 27th birthday upon graduation and commissioning, and be morally qualified and possess officer like qualifications. Scholarship benefits cover all academic tuition and certain fees, required books and academic equipment, Navy/Marine Corps Uniforms, $250-$400 per month in subsistence pay for a maximum of 10 months each year. This pay increases by $50 each year, so that as seniors, Midshipmen make $400 per month. The Navy also offers a two year, subsidized College Program for Cadets who want to serve

their country in leadership roles as officers in the Navy or Marine Corps. Applicants for the College Program are selected from students already attending VMI. Prior to beginning their junior year, College Program Midshipmen with at least a 2.5 GPA will be considered for advanced standing. Midshipmen enrolled in this program receive the same Naval Science education as their counterparts in the scholarship program. After graduation, Midshipmen on scholarship or with Advanced Standing are commissioned as Ensigns in the regular Navy or Second Lieutenants in the Marine Corps.

Air Force ROTC has competitive 2-3 1/2 year scholarships that cover full or partial tuition and fees for freshmen and sophomore cadets enrolled in the program with a GPA of 2.5 or above and who meet other qualifying factors. AFROTC scholarships do not cover room and board or the VMI quartermaster charge.

Physical Requirements

Specific physical requirements vary among ROTC programs. Cadets must be physically qualified for formal enrollment in the ROTC program of their choice, including specialized programs such as aviation. **The physical examination for all ROTC programs includes testing for drug, chemical, and alcohol abuse and dependency.** Cadets are normally admitted to the Army or the Naval ROTC College Program (Basic) (first two years) upon successful completion of the VMI entrance physical and are given a physical examination before formal enrollment in the Advanced ROTC Program (last two years). Eligible Air Force ROTC cadets who are competing for a commission are normally examined during their first year at VMI.

Benefits

Qualified ROTC cadets will receive the following benefits:

- Uniform allowance up to approximately $3,000 over four years.
- Army ROTC contracted cadets receive a tax free monthly stipend of $300 as a freshman, $350 as a sophomore, $450 as a junior, and $500 as a senior.
- Naval ROTC scholarship and college program advanced standing cadets receive a monthly stipend. Freshmen receive $250, sophomores $300, juniors $350, and seniors $400. College program basic cadets receive a uniform allowance only.
- Air Force ROTC contracted cadets will receive a monthly stipend of $300 for freshman, $350 for sophomores, $450 for juniors, and $500 for seniors.
- Summer training pay, which varies with type and length of training, plus a travel allowance, room, board, and uniforms if required.

Summer Training

Army.

Cadets intent on commissioning may compete for training opportunities at a number of Army schools during the summer months. These schools include Airborne, Air Assault, Northern Warfare, and Mountain Warfare. During the summer after the junior year, all contracted cadets will attend the Cadt Leaders Course (CLC), known as "Warrior Forge" at Fort Knox, KY. A cadet's performance at this intensive five-week training event plays a significant role in the cadet's competition for an Army commission, determining the type of commission, selection of Army professional branch, and follow-on duty assignments. After CLC, selected cadets may attend Cadet Troop Leader Training (CTLT). CTLT cadets are sent to regular Army units in the United States and overseas to perform as platoon leaders for two or three weeks, depending on location.

Navy/Marine Corps.

Scholarship Program Midshipmen of both services are trained for approximately four to six weeks during each summer between academic years.

- **1st Summer:**
  - (ALL) Career Orientation and Training for Midshipmen (CORTRAMID). Midshipmen will spend a week with each Naval community (aviation, submarines, and surface) and one week with the Marine Corps. The intent is to introduce the midshipmen to the career opportunities available in each community/service.
- **2nd Summer:**
  - (Navy) Enlisted Cruise aboard operational ships across the fleet in order for the midshipmen to develop an appreciation of the role/life of the enlisted sailor.
  - (Marine) Mountain Warfare Training Center (MWTC) in Bridgeport, CA, learning small unit leadership skills in an arduous Mountain environment. Those Marine Option Midshipmen who are not selected for MWTC shall attend an amphibious surface cruise.
- **3rd Summer:**
  - (Navy) Junior Officer Cruise in the midshipmen's chosen/desired warfare community.
  - (Marine) Officer Candidate School, Quantico, VA.

Note: 3rd Summer training is a Title 10, U.S.C. requirement in order to commission as an Ensign or 2nd Lieutenant. Advanced Standing College Program midshipmen are only required to fulfill the 3rd summer training requirement.

Air Force.

Cadets selected for enrollment into the POC must attend Air Force ROTC field traning normally during the summer between their sophomore and junior years. This training, conducted at Maxwell Air Force Base, AL, is designed to develop military leadership and discipline as well as provide an orientation to Air Force operations. At the same time, each cadet is evaluated for potential as an Air Force officer. Field training normally includes marksmanship, expeditionary operations, and physical fitness training. A variety of professional development training programs are available to qualified GMC cadets during the summer between their freshman and sophomore years and to interested POC cadets between their junior and senior years. Cadets may participate in career field orientation at locations around the world in jobs such as pilot, aircraft maintenance, security forces, or missile launch officer.

Commissions

Successful completion of the ROTC program leads to a commission in one of the armed forces provided the cadet is fully eligible and qualified under regulations of the Department of Defense. The Army also offers Reserve Force and National Guard commissions.

Credits for Previous Military Service or ROTC

Cadets who have served in the armed forces but do not hold reserve commissions may be given credit for all or part of the Basic Course at the discretion of the Professor of Military Science (PMS) or the Professor of Aerospace Studies (PAS).

Credit for ROTC work at another institution offering senior ROTC courses is allowed upon receipt of an official transcript of the ROTC record from the former institution. Appropriate credit for Junior ROTC work may be granted by the PMS/PNS/PAS.

Questions about specific requirements and procedure should be referred to the PMS/PNS/PAS.

Federal Selective Service Registration Law

Enrollment at VMI does not preclude the requirement to register with the Selective Service.

Advising & Reserve Officer Training Corps (ROTC) Curriculum

Fall and Spring Semester Requirements (Updated Spring 2011)

» Aerospace Studies (AS)
» Military Science (MS)
» Naval Science (NS & MC)

Notes:

* LS courses are required for cadets who are not seeking a commission.

Academic and G.P.A. Requirements for contract/scholarship/commission seeking cadets

G.P.A. is cumulative unless otherwise stated

R.O.T.C. instructors are willing to provide assistance and/or clarification.

Air Force ext. 7354
Army ext. 7351
Marines/Navy ext. 7275

The Curricula

Fourth Class (Freshman) Year

Because the Institute has a carefully structured program leading to graduation in each of its various curricula, it is advisable to choose at the outset the curriculum in which one plans to graduate. However, there are enough elements common to all curricula in the Fourth Class not only to give cadets a sense of common academic purpose but also to make transfers possible during the first year and even the second. Basically, the curricula divide between science and engineering (Applied Mathematics, Biology, Chemistry, Civil Engineering, Computer and Information Sciences, Electrical and Computer Engineering, Mechanical Engineering, Physics, Physics with Nuclear Concentration, and Psychology, and the liberal arts (Economics and Business, English, Rhetoric, and Humanistic Studies, History, International Studies and Political Science, and Modern Languages and Cultures.

Note

The course offerings and requirements of the Virginia Military Institute are under examination and revision continually. This catalogue merely presents the offerings and requirements in effect at the time of publication and in no way guarantees that the offerings and requirements will not change.

Aerospace Studies

For further information, please see the "Reserve Officers Training Corps" section.

Applied Mathematics

The cadet who majors in applied mathematics obtains a sound basic education required for a career in the fields of Operations Research, statistics, or computational mathematics. Our approach emphasizes an interdisciplinary approach, extensive use of technology, and modeling of real world problems. A variety of positions in the military, government, industry, and business are available to a graduate with a B.S. in Applied Mathematics.

Cadets majoring in applied mathematics are also well prepared to continue their education at the graduate level in Operations Research, statistics, or applied mathematics.

Opportunities exist for cadet to participate in the Applied & Industrial Mathematics (AIM) program during the summer or internships with governmental agencies or in the private sector. Recently, cadets have taken internships at the Center for Army Analysis, Johns Hopkins Applied Physics Labs, MIT Lincoln Labs, and NASA.

Mathematics staff members serve as curricular advisers to aid majors in planning their degree programs. Normally, the same adviser approves a major's program each semester and advises the cadet throughout the entire cadetship.

Major in Applied Mathematics

» Applied Mathematics, B.S.

Minors in Applied Mathematics

» Mathematics Minor

Applied Mathematics, B.S.

Requirements for B.S. Degree in Applied Mathematics

The B.S. in Applied Mathematics requires 136 semester hours which includes a minimum of 58 hours of mathematics. The following gives minimum requirements for the degree. Additional courses to complete the requirements must be chosen by the cadet with the approval of his/her departmental adviser.

Mathematics

MA 103—Matrix Algebra Credit Hours: 2
MA 110—Mathematical Software Credit Hours: 3
MA 123—Calculus & Analytic Geometry I Credit Hours: 3
MA 124—Calculus & Analytic Geometry II Credit Hours: 3
MA 215—Calculus With Analytic Geometry III Credit Hours: 4
MA 305—Elementary Linear Algebra Credit Hours: 3
MA 310—Matlab Programming Credit Hours: 3
MA 311—Elementary Differential Equations Credit Hours: 3
MA 319—Mathematical Methods of Operations Research Credit Hours: 3
MA 320—Mathematical Modeling Credit Hours: 3
MA 326—Probability and Statistics Credit Hours: 3
MA 405—Statistics Credit Hours: 3
MA 432—Numerical Analysis Credit Hours: 3
MA 490W—Research Practicum in Applied Mathematics Credit Hours: 3
MA 495—Advanced Research Projects in Applied Mathematics Credit Hours: 1-3
and 15 semester hours chosen from 300 or 400 level mathematics courses

Science

16 semester hours from two different sciences.
All courses must be laboratory courses.

English, Rhetoric, and Humanistic Studies

10 semester hours to include
ERH 101—Writing and Rhetoric I Credit Hours: 3
ERH 102—Writing and Rhetoric II Credit Hours: 3
ERH 103—Fundamentals of Public Speaking Credit Hours: 1
and a 200, 300 or 400 level ERH elective

History & Leadership

9 semester hours of
HI 103—World History I Credit Hours: 3
HI 104—World History II Credit Hours: 3
PS 344—Leadership in Organizations Credit Hours: 3

Military Science

12 semester hours.

Physical Education

4 semester hours.

Free Electives

27 credits of free electives with the restriction of no 100 or 200 level MA courses.

Civilization & Cultures

6 semester hours from the VMI list of approved "X" designated courses.

Writing Intensive

6 semester hours from the VMI list of approved "W" designated courses.

Synopsis of the B.S. Curriculum in Applied Mathematics

Fourth (Freshman) Class First Semester

MA 103—Matrix Algebra Credit Hours: 2
MA 123—Calculus & Analytic Geometry I Credit Hours: 3 *
Science Requirement—(BI, CH, or PY w/ lab) Credit Hours: 4
ERH 101—Writing and Rhetoric I Credit Hours: 3 *
HI 103—World History I Credit Hours: 3
PE 102—Boxing Credit Hours: 0.5
or
PE 105—Wellness Concepts Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 16.5

Second Semester

MA 110—Mathematical Software Credit Hours: 3
MA 124—Calculus & Analytic Geometry II Credit Hours: 3
Science Requirement—(BI, CH, or PY w/ lab) Credit Hours: 4
ERH 102—Writing and Rhetoric II Credit Hours: 3 *
HI 104—World History II Credit Hours: 3
PE 102—Boxing Credit Hours: 0.5
or
PE 105—Wellness Concepts Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 17.5

Third (Sophomore) Class First Semester

MA 215—Calculus With Analytic Geometry III Credit Hours: 4
MA 310—Matlab Programming Credit Hours: 3
MA 311—Elementary Differential Equations Credit Hours: 3
ELEC Science—Elective (Biology, Chemistry or Physics w/ lab) Credit Hours: 4
PE 101—Basic Swimming and Survival Credit Hours: 0.5
or
PE 300—Principles of Physical Conditioning Credit Hours: 1
ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 15.5-16

Second Semester

MA 320—Mathematical Modeling Credit Hours: 3
ELEC Science—Elective (Biology, Chemistry or Physics w/ lab) Credit Hours: 4
PS 344—Leadership in Organizations Credit Hours: 3
ELEC Free—Free Elective Credit Hours: 3
ELEC Free—Free Elective Credit Hours: 3
PE 101—Basic Swimming and Survival Credit Hours: 0.5
or
PE 300—Principles of Physical Conditioning Credit Hours: 1
ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 17.5—18

Second (Junior) Class First Semester

MA 305—Elementary Linear Algebra Credit Hours: 3
MA 326—Probability and Statistics Credit Hours: 3
ELEC Mathematics—Mathematics Elective Credit Hours: 3
ELEC Free—Free Elective Credit Hours: 3
ELEC Free—Free Elective Credit Hours: 3
PE Requirement—Elective Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 17.5

Second Semester

MA 319—Mathematical Methods of Operations Research Credit Hours: 3
MA 405—Statistics Credit Hours: 3
ELEC Mathematics—Mathematics Elective Credit Hours: 3
ELEC ERH—ERH Elective Credit Hours: 3
ELEC Free—Free Elective Credit Hours: 3
PE Requirement—Elective Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 17.5

First (Senior) Class First Semester

MA 432—Numerical Analysis Credit Hours: 3
MA 490W—Research Practicum in Applied Mathematics Credit Hours: 3
ELEC Mathematics—Mathematics Elective Credit Hours: 3
ELEC Free—Free Elective Credit Hours: 3
ELEC Free—Free Elective Credit Hours: 3
PE Requirement—Elective Credit Hours: 0.5

ROTC Requirement—AS, MS, or NS Credit Hours: 2

Total Semester Hrs: 17.5

Second Semester

MA 495—Advanced Research Projects in Applied Mathematics Credit Hours: 1-3
ERH 103—Fundamentals of Public Speaking Credit Hours: 1
ELEC Mathematics—Mathematics Elective Credit Hours: 3
ELEC Mathematics—Mathematics Elective Credit Hours: 3
ELEC Free—Free Elective Credit Hours: 3
ELEC Free—Free Elective Credit Hours: 3
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 16
Total Hours: minimum 136
* Minimum Grade of C required

Biology

The mission of the VMI biology department is to broadly train students to understand how living organisms function and to appreciate the intricacies and interactions that govern all living systems. This mission supports the broader VMI mission of creating citizen soldiers, by equipping students to make informed decisions that will better society. We accomplish this by providing students with broad training and a fundamental background in the biological sciences. The biology department offers both a B.S. and B.A. degree. The B.S. degree is designed for those students seeking a traditional biology curriculum that prepares them well for continuing their education at the post-graduate level (M.S., Ph.D., M.D., D.O, D.D.S, or D.V.M.). The B.A. degree provides the flexibility for a student to pursue a double major, either in the sciences or humanities, or for a student to pursue multiple minors in different disciplines. Both the B.S. and B.A. degrees require completion of the introductory course sequence (BI 111, BI 112, and BI 113) and the capstone course (BI 420W). Within biology, both B.S. and B.A. students must take one class in each of the four, Core Areas and an additional 14 hours of biology course work. In addition, students completing the B.S. in biology will take five semesters of chemistry (general chemistry I and II with labs, organic chemistry I and II with labs, and biochemistry) and two semesters of physics (general physics I and II with labs). Students completing the B.A. in biology must show proficiency in a foreign language (completion through the 200 level of a language), take two semesters of chemistry (general chemistry I and II with labs) and then either the organic chemistry sequence or the physics sequence. Both degree programs are tailored to allow a student to pursue a concentration within the major as described under "Academic Concentrations in Biology" or the minor in Exercise Science. Faculty members believe that interaction with cadets in the classroom, laboratory, and on an individual basis is critical in the development of the successful biology major. In keeping with this philosophy, class sizes are small, laboratories accompany most courses, advising is conducted on an individual basis, and undergraduate research is encouraged. The biology department has a funded summer research experience, the Dr. Fred C. Swope Summer Scholars Program, and many additional opportunities for funded undergraduate research experiences exist through VMI's Summer Undergraduate Research Initiative (SURI).

Capstone Experiences in Undergraduate Research Requirement (3 credits)

Successful completion of the Capstone Experience in Biology is a graduation requirement. It is intended to provide a comprehensive experience involving the application, integration, and critical analysis of information and data through an intensive literature-based paper or an independent research project under the guidance of a faculty mentor. The requirement is fulfilled by completing BI 420W Senior Seminar. For students enrolled in the Institute Honors program, BI 420W should be taken in place of HN 400—HN 401 Institute Honors.

Dr. Fred C. Swope Summer Scholars Program

The Dr. Fred C. Swope Summer Undergraduate Research Program in Biology at the Virginia Military Institute was established in 1991 and is named after one of VMI's most visionary Biology Department Chairmen, COL Fred C. Swope. This summer program in combination with Institute opportunities is designed to acquaint undergraduate students with the philosophy, practices, and techniques of research. During the months of May, June, and July students engage in a research project with a faculty mentor. At the end of the summer or during the following academic year students in the program present their research findings to the department's faculty and other biology majors. Students are encouraged to continue their research interests into the following academic year and beyond in anticipation of completion of a Department or Institute Honors Thesis. Upon the completion of these undergraduate research experiences the student has acquired a meaningful and in depth knowledge of the research process and has a realistic idea of what is involved in pursuing post-graduate studies.

Honors in Biology

A cadet can earn departmental honors by completing a research project in their 1st class year and presenting the research to the department. Eligibility to apply for departmental honors requires 1st class standing and a minimum cumulative and biology GPA of 3.000. An application in the form of a research proposal is submitted to the department at the end of the 2nd class year or at the beginning of the 1st class year. If the department approves the proposal, then the cadet will enroll in BI 490/490W (independent research in the fall) and then BI 491/491W (independent research in the spring). By the middle of April, a formal research paper will be submitted to the department at least two weeks prior to the oral presentation (defense). The awarding of Honors in Biology will be made following successful completion of the research project and oral defense.

Majors in Biology

» Bachelor of Science
» Biology, B.S.
» Bachelor of Arts
» Biology, B.A.

Concentrations in Biology

These concentrations offer an opportunity for cadets to focus their interests in various fields of biology and to develop intellectual pursuits with their professors as mentors in undergraduate research. If cadets wish to pursue an area of specialty, they are strongly encouraged to select one of the concentrations listed below no later than fall pre-registration during their third class year. A student successfully completing a concentration will earn a B.S. or B.A. degree with recognition of the concentration on the final transcript.

» Biochemistry and Molecular Biology (BMB) Concentration

» Ecology, Conservation, and Organismal Sciences (ECOS) Concentration

Minor in Exercise Science

The Minor in Exercise Science is designed to provide cadets with a comprehensive introduction to the foundations of exercise and fitness. This interdisciplinary minor can be declared through the department of biology or the department of physical education.

» Exercise Science Minor

Biology, B.A.

The B.A. degree in biology is designed to give the student a solid background in the biological and natural sciences while maintaining the flexibility for the student to pursue coursework in areas of interest or pursue a second major or multiple minors. The required introductory sequence provides the fundamental background in biology to move into the upper-level courses. The four, Core Areas allow flexibility in selecting courses while providing a breadth of background. The Core Areas emphasize ecological or biological diversity concepts, anatomy, organismal functioning, and cellular functioning. The additional 14 hours of biology course work allow a student to focus on one or several of these core areas. Students pursuing a B.A. degree are required to demonstrate proficiency in a modern language through the 200-level. Students wishing to have a study abroad experience may find that the B.A. degree program offers the flexibility to incorporate that learning experience into their degree program.

B.A. Curriculum

Common Core Course Requirements

All B.A. biology majors are required to complete the following courses:
BI 111—Fundamentals of Biology I Credit Hours: 4
BI 112—Fundamentals of Biology II Credit Hours: 4
BI 113—Fundamentals of Biology III Credit Hours: 4
BI 420W—Capstone Research Experience Credit Hours: 3

Core Area Pairings

In addition to these courses, a B.A. major must select one course from each of the following core area pairings:

Organismal Biology

BI 206—Tropical Marine Biology Credit Hours: 3
BI 301—Nematology Credit Hours: 3
BI 307—Vertebrate Biology Credit Hours: 4
BI 310—Evolutionary Biology Credit Hours: 3
BI 311—Aquatic Ecosystems Credit Hours: 4
BI 312—Ecology Credit Hours: 4
BI 321—Invertebrate Zoology Credit Hours: 4
BI 324—Ornithology Credit Hours: 4
BI 326—Parasitology Credit Hours: 4

Anatomy

BI 217—General Botany Credit Hours: 4
BI 303—Developmental Biology Credit Hours: 4
BI 304—Comparative Vertebrate Morphology Credit Hours: 4
BI 306—Histology Credit Hours: 4

Physiology

BI 204—Physiology Credit Hours: 4
BI 325—Ecological Biochemistry Credit Hours: 4
BI 335—Neurobiology Credit Hours: 4

Cellular/Molecular Biology

BI 313—Microbiology Credit Hours: 4
BI 346—Genetics Credit Hours: 4
BI 404—Cell Biology Credit Hours: 3
BI 406—Virology Credit Hours: 3
BI 411—Immunology Credit Hours: 3
BI 430—Molecular Biology Credit Hours: 3

Additional Hours

Additional hours (14) must be selected from any area within the biology curriculum except for research hours to total a minimum of 43 hours in biology. In addition to the biology courses, B.A. majors must complete Math that Matters I and II (MA 101 and MA 102) and show proficiency in a foreign language through the 200 level. Cadets in the B.A. major must complete either two semesters of organic chemistry with lab (CH 223 and CH 229, CH 224 and CH 230) or General Physics I and II (PY 120 and PY 155, PY 121 and PY 156). To broaden the education, six credits of any English, rhetoric, and humanistic studies (ERH) courses above the 100 level are required. Additionally, 12 non-science elective (LA) credits must be completed in either English, rhetoric, and humanistic studies (ERH), history, economics, business, psychology, political science, or modern languages. The remainder (9) of the 136 hours required for graduation can be taken from any department on Post.

Additional Core Curriculum Requirements

All B.S. and B.A. biology majors are also required to satisfy four additional Core Curriculum requirements:

1. Two writing intensive courses must be taken with one in the biology major.
2. Two Civilizations and Cultures courses (6 credits).
3. PS 344—Leadership in Organizations
4. ERH 103—Fundamentals of Public Speaking

Synopsis of the B.A. Curriculum in Biology

Fourth (Freshman) Class First Semester

BI 111—Fundamentals of Biology I Credit Hours: 4
ERH 101—Writing and Rhetoric I Credit Hours: 3 *
HI 103—World History I Credit Hours: 3
or
MA 101—Math that Matters I Credit Hours: 3
CH 137—Introductory College Chemistry I Credit Hours: 3

CH 117—Laboratory for CH 137 Credit Hours: 1
PE 105—Wellness Concepts Credit Hours: 0.5
or
PE 102—Boxing Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 15.5

Second Semester

BI 112—Fundamentals of Biology II Credit Hours: 4
ERH 102—Writing and Rhetoric II Credit Hours: 3 *
HI 104—World History II Credit Hours: 3
or
MA 102—Math that Matters II Credit Hours: 3
CH 138—Introductory College Chemistry II Credit Hours: 3
CH 118—Laboratory for CH 138 Credit Hours: 1
PE 105—Wellness Concepts Credit Hours: 0.5
or
PE 102—Boxing Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 15.5

Third (Sophomore) Class First Semester

BI 113—Fundamentals of Biology III Credit Hours: 4
ELEC ERH—ERH Elective Credit Hours: 3
MA 101—Math that Matters I Credit Hours: 3
or
HI 103—World History I Credit Hours: 3
ELEC Foreign Language—Foreign Language Elective Credit Hours: 3
ELEC Free—Free Elective Credit Hours: 3
PE 101—Basic Swimming and Survival Credit Hours: 0.5
or
PE 300—Principles of Physical Conditioning Credit Hours: 1
ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 17.5-18

Second Semester

BI Core—Core Area Elective Credit Hours: 3
ELEC Major—Major Elective Credit Hours: 4
ELEC ERH—ERH Elective Credit Hours: 3
MA 102—Math that Matters II Credit Hours: 3
or
HI 104—World History II Credit Hours: 3
ERH 103—Fundamentals of Public Speaking Credit Hours: 1
ELEC Foreign Language—Foreign Language Elective Credit Hours: 3
PE 101—Basic Swimming and Survival Credit Hours: 0.5
or
PE 300—Principles of Physical Conditioning Credit Hours: 1
ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 18.5-19

Second (Junior) Class First Semester

BI Core—Core Area Elective Credit Hours: 4
CH 223—Organic Chemistry I Credit Hours: 3 and
CH 229—Organic Laboratory I for Non-Majors Credit Hours: 1.5
or
PY 120—General Physics I Credit Hours: 3 and
PY 155—General Physics Laboratory I Credit Hours: 1
PS 344—Leadership in Organizations Credit Hours: 3
ELEC Foreign Language—Foreign Language Elective Credit Hours: 3
or
ELEC Major—Major Elective Credit Hours: 3
PE Requirement—Elective Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 16.5-17

Second Semester

ELEC Major—Major Elective Credit Hours: 4
CH 224—Organic Chemistry II Credit Hours: 3 and
CH 230—Organic Laboratory II for Non-Majors Credit Hours: 1.5
or
PY 121—General Physics II Credit Hours: 3 and
PY 156—General Physics Laboratory II Credit Hours: 1
BI Elective—Non-Science Elective Credit Hours: 3
ELEC Foreign Language—Foreign Language Elective Credit Hours: 3
or
ELEC Major—Major Elective Credit Hours: 3
PE Requirement—Elective Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 16.5-17

First (Senior) Class First Semester

BI 420W—Capstone Research Experience Credit Hours: 3
BI Core—Core Area Elective Credit Hours: 3
BI Elective—Non-Science Elective Credit Hours: 3
BI Elective—Non-Science Elective Credit Hours: 3
ELEC Free—Free Elective Credit Hours: 3
PE Requirement—Elective Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 17.5

Second Semester

BI Core—Core Area Elective Credit Hours: 4
ELEC Free—Free Elective Credit Hours: 3
ELEC Free—Free Elective Credit Hours: 3
BI Elective—Non-Science Elective Credit Hours: 3
BI Elective—Non-Science Elective Credit Hours: 3
ROTC Requirement—AS, MS, or NS Credit Hours: 2

Total Semester Hrs: 18
Total Hours: minimum 136

Cadets who complete Organic Chemistry I & II and labs (9 credits) may reduce the free elective requirement by one hour.

* Minimum Grade of C Required.
Proficiency through 200 level language is required.

Biology, B.S.

The B.S. degree in biology is designed to give the student a solid background in the biological and natural sciences while maintaining the flexibility for the student to select courses that meet interests and career goals. The required introductory sequence provides the fundamental background in biology to move into the upper-level courses. The four, Core Areas allow flexibility in selecting courses while providing a breadth of background. The Core Areas emphasize ecological or biological diversity concepts, anatomy, organismal functioning, and cellular functioning. The additional 14 hours of biology course work allow a student to focus on one or several of these core areas. Inherent to the understanding of biological systems is knowledge of both chemistry and physics. The requirement for the B.S. candidates to complete 20 hours of training in the natural sciences serves to provide a breadth of understanding of biological systems.
B.S. Curriculum

Common Core Course Requirements

All B.S. biology majors are required to complete the following courses:
BI 111—Fundamentals of Biology I Credit Hours: 4
BI 112—Fundamentals of Biology II Credit Hours: 4
BI 113—Fundamentals of Biology III Credit Hours: 4
BI 420W—Capstone Research Experience Credit Hours: 3

Core Area Pairings

In addition to these courses, a B.S. major must select one course from each of the following core area pairings:

Organismal Biology

BI 206—Tropical Marine Biology Credit Hours: 3
BI 301—Nematology Credit Hours: 3
BI 307—Vertebrate Biology Credit Hours: 4
BI 310—Evolutionary Biology Credit Hours: 3
BI 311—Aquatic Ecosystems Credit Hours:4
BI 312—Ecology Credit Hours: 4
BI 321—Invertebrate Zoology Credit Hours: 4
BI 324—Ornithology Credit Hours: 4
BI 326—Parasitology Credit Hours: 4

Anatomy

BI 217—General Botany Credit Hours: 4
BI 303—Developmental Biology Credit Hours: 4
BI 304—Comparative Vertebrate Morphology Credit Hours: 4
BI 306—Histology Credit Hours: 4

Physiology

BI 204—Physiology Credit Hours: 4
BI 325—Ecological Biochemistry Credit Hours:4
BI 335—Neurobiology Credit Hours: 4

Cellular/Molecular Biology

BI 313—Microbiology Credit Hours: 4
BI 346—Genetics Credit Hours: 4
BI 404—Cell Biology Credit Hours: 3
BI 406—Virology Credit Hours: 3
BI 411—Immunology Credit Hours: 3
BI 430—Molecular Biology Credit Hours: 3

Additional Hours

Additional hours (14) must be selected from any area within the biology curriculum except for research hours to total a minimum of 43 hours in biology. In addition to the biology courses, B.S. majors must complete two semesters of Organic Chemistry with lab (CH 223 and CH 229, CH 224 and CH 230), Biochemistry (CH 322) or Ecological Biochemistry (BI 325), Math That Matters I and II (MA 101 and MA 102), and General Physics I and II (PY 120 and PY 155, PY 121 and PY 156). To broaden the education, six credits of any English, rhetoric, and humanistic studies (ERH) courses above the 100 level are required. Additionally, 12 non-science elective (LA) credits must be completed in English, rhetoric, and humanistic studies, history, economics, business, psychology, political science, or modern languages. The remainder (9) of the 136.5 hours required for graduation can be taken from any department on Post. Cadets completing the B.S. degree often complete minors in other disciplines. A minor in chemistry can be completed by taking one additional course from selected courses in the chemistry curriculum. The requirements for minors in psychology, history or English, rhetoric, and humanistic studies areas, for example, fit in well with our elective requirements.

Additional Core Curriculum Requirements

All B.S. and B.A. biology majors are also required to satisfy four additional Core Curriculum requirements:
1. Two writing intensive courses must be taken with one in the biology major.
2. Two Civilizations and Cultures courses (6 credits).
3. PS 344—Leadership in Organizations
4. ERH 103—Fundamentals of Public Speaking

Synopsis of the B.S. Curriculum in Biology

Fourth (Freshman) Class First Semester

BI 111—Fundamentals of Biology I Credit Hours: 4
ERH 101—Writing and Rhetoric I Credit Hours: 3 *
HI 103—World History I Credit Hours: 3
or
MA 101—Math that Matters I Credit Hours: 3
CH 137—Introductory College Chemistry I Credit Hours: 3
CH 117—Laboratory for CH 137 Credit Hours: 1
PE 105—Wellness Concepts Credit Hours: 0.5
or
PE 102—Boxing Credit Hours: 0.5

ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 15.5

Second Semester

BI 112—Fundamentals of Biology II Credit Hours: 4
ERH 102—Writing and Rhetoric II Credit Hours: 3 *
HI 104—World History II Credit Hours: 3
or
MA 102—Math that Matters II Credit Hours: 3
CH 138—Introductory College Chemistry II Credit Hours: 3
CH 118—Laboratory for CH 138 Credit Hours: 1
PE 105—Wellness Concepts Credit Hours: 0.5
or
PE 102—Boxing Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 15.5

Third (Sophomore) Class First Semester

BI 113—Fundamentals of Biology III Credit Hours: 4
ELEC ERH—ERH Elective Credit Hours: 3
MA 101—Math that Matters I Credit Hours: 3
or
HI 103—World History I Credit Hours: 3
CH 223—Organic Chemistry I Credit Hours: 3
CH 229—Organic Laboratory I for Non-Majors Credit Hours: 1.5
PE 101—Basic Swimming and Survival Credit Hours: 0.5
or
PE 300—Principles of Physical Conditioning Credit Hours: 1
ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 16-16.5

Second Semester

BI Core—Core Area Elective Credit Hours: 3
or
ELEC Major—Major Elective Credit Hours: 3
MA 102—Math that Matters II Credit Hours: 3
or
HI 104—World History II Credit Hours: 3
CH 224—Organic Chemistry II Credit Hours: 3
CH 230—Organic Laboratory II for Non-Majors Credit Hours: 1.5
ELEC Free—Free Elective Credit Hours: 3
ELEC ERH—ERH Elective Credit Hours: 3
PE 101—Basic Swimming and Survival Credit Hours: 0.5
or
PE 300—Principles of Physical Conditioning Credit Hours: 1
ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 18-18.5

Second (Junior) Class First Semester

BI Core—Core Area Elective Credit Hours: 4
BI Core—Core Area Elective Credit Hours: 4
PY 120—General Physics I Credit Hours: 3
PY 155—General Physics Laboratory I Credit Hours: 1
ERH 103—Fundamentals of Public Speaking Credit Hours: 1
PS 344—Leadership in Organizations Credit Hours: 3
PE Requirement—Elective Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 18.5

Second Semester

ELEC Major—Major Elective Credit Hours: 4
BI Core—Core Area Elective Credit Hours: 3
PY 121—General Physics II Credit Hours: 3
PY 156—General Physics Laboratory II Credit Hours: 1
BI Elective—Non-Science Elective Credit Hours: 3
PE Requirement—Elective Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 16.5

First (Senior) Class First Semester

BI 420W—Capstone Research Experience Credit Hours: 3
BI Core—Core Area Elective Credit Hours: 4
BI Elective—Non-Science Elective Credit Hours: 3
BI Elective—Non-Science Elective Credit Hours: 3
BI 325—Ecological Biochemistry Credit Hours: 4
or
CH 322—Metabolic Biochemistry Credit Hours: 3
PE Requirement—Elective Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 18.5-19.5

Second Semester

BI Elective—Non-Science Elective Credit Hours: 3
ELEC Major—Major Elective Credit Hours: 3
ELEC Major—Major Elective Credit Hours: 3
ELEC Free—Free Elective Credit Hours: 3
ELEC Free—Free Elective Credit Hours: 3
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 17
Total Hours: minimum 136

*Minimum Grade of C Required.

Chemistry

The mission of the chemistry department is to provide cadets who major in chemistry with a thorough foundation in chemistry, mastery of modern chemical instrumentation, excellent analytical and mathematical skills and the ability to think things through and solve problems. These skills are highly sought after in every career field. The department offers two degree tracks; the B.S. degree and the B.A. degree in chemistry. The B.S. degree provides the most comprehensive preparation for further work or study in chemistry or a related field such as:

» Chemical Engineering
» Material Science
» Environmental Science
» Pharmacology

The Chemistry Department's B.S. degree is approved by the American Chemical Society and cadets fulfilling the requirements for a B.S. are certified as having met the standards of professional training by the society. The B.S. degree has two tracks to choose from: a pre-med option and a research option.

The B.A. degree provides cadets with an opportunity to pursue other interests in preparation for a career of their choosing while providing a solid foundation in the basic areas of chemistry. This degree requires cadets to choose another focus area outside of chemistry and complete either a minor, concentration or certification. Faculty members will work closely with B.A. majors to design a program that best meets the cadets' career goals. Career choices could correspond to the following focus areas:

» Medical, Dental Schools-Concentration in Biochemistry and Molecular Biology
» Military or Intelligence Agencies-International Studies Minor, National Security Minor, Arabic Minor
» Law Enforcement or Forensics-Concentration in Biochemistry and Molecular Biology
» Business/MBA-Business or Economics Minor
» Math/Science Teacher-Teacher Certification Program

Faculty members believe that close interaction with cadets in the classroom and in the chemical laboratory is critical in the development of good chemistry majors. This personal mentoring occurs in many ways but especially in our small classes and during undergraduate research projects. All chemisrty majors are encouraged to participate in an undergraduate research experience under the guidance of a faculty member either in a 10 week summer program, or during the academic year. The majority of chemistry majors participate in at least one undergraduate research experience. Most of these cadets will present their research at a local or regional professional meeting, and a smaller number will have their results published. Chemistry majors also have the opportunity to work as an industrial intern with a company during the summer. Chemistry cadets who have demonstrated excellence in the study of chemistry are invited to participate in the departmental honors program during their first class year. Cadets who accept the invitation will be engaged in more extensive research under the close supervision of a faculty sponsor.

The laboratory facilities and instrumentation housed in Maury-Brooke Hall provide majors with the modern techniques needed to learn and practice the science of chemistry both in structured courses and labs and also in independent research. Instrumentation includes liquid and gas chromatographs; several infrared, visible, ultraviolet, and fluorescence spectrometers; a nuclear magnetic resonance spectrometer, a single crystal X-ray diffractometer, a differential scanning calorimeter, a microwave reactor, a dual potentiostat with rotating-ring disc electrode, and atomic absorption and flame emission spectrometers. The department also maintains a computer facility for molecular modeling and chemistry tutorials.

Majors in Chemistry

» Bachelor of Science
» Chemistry, B.S.—Pre-Medical Track
» Chemistry, B.S.—Research Track
» Bachelor of Arts
» Chemistry, B.A.

Concentrations in Chemistry

» Biochemistry and Molecular Biology (BMB) Concentration

Minors in Chemistry

» Chemistry Minor

Chemistry, B.A.

B.A. Curriculum

Synopsis indicates core requirements for this degree. Demonstrated proficiency of two years of a foreign language is required. Chemistry B.A. majors are also required to complete either (1) a minor in another department, or (2) a Concentration in Biochemistry and Molecular Biology. Among the more popular focus areas are the Biochemistry and Molecular Biology (BMB) Concentration and the Business Minor.

Synopsis of the B.A. Curriculum in Chemistry

Fourth (Freshman) Class First Semester

CH 125—Laboratory for CH 137 Credit Hours: 2
CH 137—Introductory College Chemistry I Credit Hours: 3
MA 123– Calculus & Analytic Geometry I Credit Hours: 3 *
HI 103–World History I Credit Hours: 3
ERH 101–Writing and Rhetoric I Credit Hours: 3
PE 102–Boxing Credit Hours: 0.5
or
PE 105–Wellness Concepts Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 15.5

Second Semester

CH 126–Laboratory for CH 138 Credit Hours: 2
CH 138–Introductory College Chemistry II Credit Hours: 3
MA 124–Calculus & Analytic Geometry II Credit Hours: 3
HI 104–World History II Credit Hours: 3
ERH 102–Writing and Rhetoric II Credit Hours: 3 *
PE 102–Boxing Credit Hours: 0.5
or
PE 105–Wellness Concepts Credit Hours: 0.5

ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 15.5

Third (Sophomore) Class First Semester

CH 223—Organic Chemistry I Credit Hours: 3 *
CH 225–Organic Laboratory I Credit Hours: 3
ELEC Foreign Language–Foreign Language Elective Credit Hours: 3 1
Science Requirement—Core Credit Hours: 4 (Biology or Physics w/ lab)2
CH Elective–Concentration Elective Credit Hours: 3 3
PE 101–Basic Swimming and Survival Credit Hours: 0.5
or
PE 300–Principles of Physical Conditioning Credit Hours: 1
ROTC Requirement–AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 17.5-18

Second Semester

CH 224—Organic Chemistry II Credit Hours: 3
CH 226—Organic Laboratory II Credit Hours: 3
PS 344—Leadership in Organizations Credit Hours: 3 1
ELEC Foreign Language—Foreign Language Elective Credit Hours: 3 1
Science Requirement—Core Credit Hours: 4 (Biology or Physics w/ lab)2
PE 101—Basic Swimming and Survival Credit Hours: 0.5
or
PE 300—Principles of Physical Conditioning Credit Hours: 1
ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 17.5-18

Second (Junior) Class First Semester

CH 301—Physical Chemistry I Credit Hours: 3
CH 311W—Laboratory for CH 301 Credit Hours: 3
ELEC Free—Free Elective Credit Hours: 3 1
CH Elective—Concentration Elective Credit Hours: 3 3
ELEC Foreign Language—Foreign Language Elective Credit Hours: 3 1
ROTC Requirement—AS, MS, or NS Credit Hours: 2
PE Requirement—Elective Credit Hours: 0.5
Total Semester Hrs: 17.5

Second Semester

CH 246—Inorganic Chemistry Credit Hours: 3
CH 321—Structural Biochemistry Credit Hours: 3
CH Requirement—Advanced Chemistry Course Credit Hours: 3 (300-level or above)
CH Elective—Concentration Elective Credit Hours: 3 3
ELEC Foreign Language—Foreign Language Elective Credit Hours: 3
PE Requirement—Elective Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 17.5

First (Senior) Class First Semester

CH 335—Analytical Chemistry I Credit Hours: 3
CH 337—Laboratory for CH 335 Credit Hours: 3
ELEC Free—Free Elective Credit Hours: 3 1
CH Elective—Concentration Elective Credit Hours: 3 3
CH 401—Advanced Topics in Chemistry Credit Hours: 3
PE Requirement—Elective Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 17.5

Second Semester

CH Elective—Concentration Elective Credit Hours: 3 3
ERH 103—Fundamentals of Public Speaking Credit Hours: 1
ELEC Free—Free Electives Credit Hours: 11 1
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 17
Total Hours: minimum 136
* Minimum Grade of C Required

1. Twelve semester hours of electives must be in the Humanistic-Social area. In addition to demonstrating proficiency in a foreign language, cadets must complete 6 credit hours of cultures and civilization courses (study abroad may be substituted for 3 hours) and 3 credit hours of Leadership in Organizations.
2. A two-semester sequence of core-curriculum approved science and laboratory. The specific course may be determined by the chosen concentration area.
3. Concentration Electives are determined by the chosen minor/concentration/or certification. The chosen field may require use of free electives to complete.

Chemistry, B.S.—Pre-Medical Track

Synopsis of the B.S. Curriculum in Chemistry—Pre-Medical Track

Fourth (Freshman) Class First Semester

CH 125—Laboratory for CH 137 Credit Hours: 2
CH 137—Introductory College Chemistry I Credit Hours: 3
MA 123—Calculus & Analytic Geometry I Credit Hours: 3 *
HI 103—World History I Credit Hours: 3
ERH 101—Writing and Rhetoric I Credit Hours: 3 *
PE 102—Boxing Credit Hours: 0.5
or
PE 105—Wellness Concepts Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 15.5

Second Semester

CH 126—Laboratory for CH 138 Credit Hours: 2
CH 138—Introductory College Chemistry II Credit Hours: 3
MA 124—Calculus & Analytic Geometry II Credit Hours: 3 *
HI 104—World History II Credit Hours: 3
ERH 102—Writing and Rhetoric II Credit Hours: 3 *
PE 102—Boxing Credit Hours: 0.5
or
PE 105—Wellness Concepts Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 15.5

Third (Sophomore) Class First Semester

CH 223—Organic Chemistry I Credit Hours: 3
CH 225—Organic Laboratory I Credit Hours: 3
MA 220—Probability & Statistics for Engineers & Scientists Credit Hours: 3
or
MA 326—Probability and Statistics Credit Hours: 3
PY 155—General Physics Laboratory I Credit Hours: 1
PY 160—General Physics I Credit Hours: 3
BI 101—General Biology I Credit Hours: 4
PE 101—Basic Swimming and Survival Credit Hours: 0.5
or
PE 300—Principles of Physical Conditioning Credit Hours: 1
ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 18.5-19

Second Semester

CH 224—Organic Chemistry II Credit Hours: 3
CH 226—Organic Laboratory II Credit Hours: 3
PY 156—General Physics Laboratory II Credit Hours: 1
PY 161—General Physics II Credit Hours: 3
BI 102—General Biology II Credit Hours: 4
PS 344—Leadership in Organizations Credit Hours: 3
PE 101—Basic Swimming and Survival Credit Hours: 0.5
or
PE 300—Principles of Physical Conditioning Credit Hours: 1
ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 18.5-19

Second (Junior) Class First Semester

CH 301—Physical Chemistry I Credit Hours: 3
CH 311W—Laboratory for CH 301 Credit Hours: 3
CH 322—Metabolic Biochemistry Credit Hours: 3
BI 346—Genetics Credit Hours: 4
PS 201—Introduction to Psychology Credit Hours: 3
PE Requirement—Elective Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 18.5

Second Semester

CH 302—Physical Chemistry II Credit Hours: 3
CH 321—Structural Biochemistry Credit Hours: 3
CH 323—Laboratory for CH 321 Credit Hours: 1.5
ELEC BI—Biology Elective Credit Hours: 3
ELEC PS—Psychology Elective Credit Hours: 3
ELEC Free—Free Elective Credit Hours: 3
PE Requirement—Elective Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 19

First (Senior) Class First Semester

CH 335—Analytical Chemistry I Credit Hours: 3
CH 337—Laboratory for CH 335 Credit Hours: 3
CH 451—Senior Thesis Credit Hours: 3
BI 404—Cell Biology Credit Hours: 3
ELEC Free—Free Elective Credit Hours: 3
PE Requirement—Elective Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 17.5

Second Semester

CH 246—Inorganic Chemistry Credit Hours: 3
CH 401—Advanced Topics in Chemistry Credit Hours: 3
CH 452—Senior Thesis Credit Hours: 3
ERH 103—Fundamentals of Public Speaking Credit Hours: 1
ELEC Free—Free Elective Credit Hours: 3
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 15
Total Hours: minimum 138.5
* Minimum Grade of C Required.

All required Civilizations & Cultures (X) and Writing Intensive (W) course requirements should be met by free electives.

Chemistry, B.S.—Research Track

Synopsis of the B.S. Curriculum in Chemistry—Research Track

Fourth (Freshman) Class First Semester

CH 125—Laboratory for CH 137 Credit Hours: 2
CH 137—Introductory College Chemistry I Credit Hours: 3
MA 123—Calculus & Analytic Geometry I Credit Hours: 3 *
HI 103—World History I Credit Hours: 3
ERH 101—Writing and Rhetoric I Credit Hours: 3 *
PE 102—Boxing Credit Hours: 0.5
or
PE 105—Wellness Concepts Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 15.5

Second Semester

CH 126—Laboratory for CH 138 Credit Hours: 2
CH 138—Introductory College Chemistry II Credit Hours: 3
MA 124—Calculus & Analytic Geometry II Credit Hours: 3 *
HI 104—World History II Credit Hours: 3
ERH 102—Writing and Rhetoric II Credit Hours: 3 *
PE 102—Boxing Credit Hours: 0.5
or
PE 105—Wellness Concepts Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 15.5

Third (Sophomore) Class First Semester

CH 223—Organic Chemistry I Credit Hours: 3
CH 225—Organic Laboratory I Credit Hours: 3
MA 311—Elementary Differential Equations Credit Hours: 3
PY 155—General Physics Laboratory I Credit Hours: 1
PY 160—General Physics I Credit Hours: 3
ERH 103—Fundamentals of Public Speaking Credit Hours: 1
ELEC Free—Free Elective Credit Hours: 3
PE 101—Basic Swimming and Survival Credit Hours: 0.5
or
PE 300—Principles of Physical Conditioning Credit Hours: 1
ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 18.5-19

Second Semester

CH 224—Organic Chemistry II Credit Hours: 3
CH 226—Organic Laboratory II Credit Hours: 3
CH 246—Inorganic Chemistry Credit Hours: 3
PY 156—General Physics Laboratory II Credit Hours: 1
PY 161—General Physics II Credit Hours: 3
PS 344—Leadership in Organizations Credit Hours: 3
PE 101—Basic Swimming and Survival Credit Hours: 0.5
or
PE 300—Principles of Physical Conditioning Credit Hours: 1
ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 17.5-18

Second (Junior) Class First Semester

CH 301—Physical Chemistry I Credit Hours: 3
CH 311W—Laboratory for CH 301 Credit Hours: 3
CH 335—Analytical Chemistry I Credit Hours: 3
CH 337—Laboratory for CH 335 Credit Hours: 3
ELEC Free—Free Elective Credit Hours: 3
PE Requirement—Elective Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 17.5

Second Semester

CH 302—Physical Chemistry II Credit Hours: 3
CH 336—Analytical Chemistry II Credit Hours: 3
CH 338—Laboratory for CH 336 Credit Hours: 3
CH 321—Structural Biochemistry Credit Hours: 3
CH 434—Chemical Synthesis Credit Hours: 3
PE Requirement—Elective Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 17.5

First (Senior) Class First Semester

CH 451—Senior Thesis Credit Hours: 3
CH 4XX—Advanced Chemistry Elective Credit Hours: 3
ELEC Free—Free Elective Credit Hours: 3
ELEC Free—Free Elective Credit Hours: 3
ELEC Free—Free Elective Credit Hours: 3
PE Requirement—Elective Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 17.5

Second Semester

CH 401—Advanced Topics in Chemistry Credit Hours: 3
CH 452—Senior Thesis Credit Hours: 3

ELEC Free—Free Elective Credit Hours: 3
ELEC Free—Free Elective Credit Hours: 3
ELEC Free—Free Elective Credit Hours: 3
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 17

Total Hours: minimum 137
* Minimum Grade of C Required.
All required Civilizations & Cultures (X) and Writing Intensive (W) course requirements should be met by free electives.

Civil and Environmental Engineering

Civil Engineering (CE) is the oldest of the engineering professions and the broadest in scope. It is the parent of all other branches of engineering. The CE curriculum at VMI includes a traditional array of courses that permit our graduates to pursue any of the specialty areas in Civil Engineering.

Civil Engineering Sub-Disciplines

Because of Civil Engineering's broad scope, cadets can choose to concentrate their studies in one of several of the subdisciplines of Civil Engineering or they may select courses across all topic areas for a more general focus. The following seven Civil Engineering sub-disciplines are available to cadets at VMI:

Construction Management is the application of engineering to time, material, labor, cost, and quality management of construction projects including the complex coordination of construction events, conformance with design specifications, and design and contract modifications to meet project-specific field conditions. Examples are highways and sports stadiums.

Environmental Engineering encompasses a wide spectrum of activities to help protect human health and promote environmental quality. Issues addressed include air quality and air pollution, municipal and industrial solid waste, hazardous waste, risk assessment, soil and groundwater contamination, water and wastewater treatment, water quality monitoring and protection, and others. Examples are clean rivers and clear air.

Fluid Mechanics & Hydraulic Engineering address the properties and analysis of fluids for applications in static and dynamic systems such as pressure on immersed objects, hydraulic machinery such as pumps and turbines and conveyance of water and other fluids. Examples are submarines and hydroelectric power plants.

Geotechnical Engineering involves soil and its properties relevant to groundwater flow, bearing capacity for foundations, settlement and compaction, slope stability, tunneling and mining, and a variety of other issues associated with activities on or below the ground surface. An example is the "Leaning Tower of Pisa."

Hydrology & Water Resources Engineering focuses on surface and groundwater quantity and supply, stormwater runoff and control, canals and river channels, reservoirs, flood control, irrigation supply, water policy, and many other related activities. Examples are Hoover Dam and the Colorado River.

Structural Engineering is the understanding of material properties and static and dynamic forces that affect structures built on a framework of concrete, steel, wood, and other materials. Structural engineering is the basis for anything that is built. Examples are skyscrapers and the Golden Gate Bridge.

Transportation & Planning Engineering applies to the efficient movement of people and goods by planning, designing, building, and maintaining facilities such as highway, rail, airport, and mass transit systems. These systems are the infrastructure backbone of much of the developed world's economy. Examples are the U.S. interstate highway system and your local mass transit system.

Suggested course selections for each of the seven Civil Engineering concentrations available to cadets are outlined here. Regardless of the specific concentration or course mix selected, graduates of the Civil and Environmental Engineering Department (CEE) receive a Bachelor of Science degree in Civil Engineering.

CE Curriculum

The Civil and Environmental Engineering program is accredited by the Engineering Accreditation Commission of ABET, *http://www.abet.org*, and provides a broad background of courses in science, engineering, and the humanities. Graduates are prepared to enter engineering or business directly or to continue their education in graduate school.

Opportunities are available for independent study during both the academic year and the summer. The department conducts a program of undergraduate research based upon the interests and qualifications of individual cadets supported by the advice and guidance of the experienced faculty. All of our full time faculty have Ph.D. degrees and are registered professional engineers.

Laboratory experience is vital to the education of an engineer and the departmental laboratories are equipped with a wide array of both instructional and commercial testing devices. Each cadet participates in laboratory work that demonstrates principles, develops skills, and provides experience with current methods in testing and measurement.

The CE curriculum includes 139 credit hours of which approximately one-half are for CE courses. The non-CE courses include 16 credit hours of mathematics, 12 credit hours of chemistry and physics, and 12 credit hours of required English and History. Other credit hours are required for ROTC and physical education, and 6 credit hours are required for approved civilizations and cultures electives. A current list of these is available from the Civil and Environmental Engineering office.

The CEE program's educational objectives are to produce graduates who are prepared to:

1. Use their broad-based civil engineering backgrounds to perform as entry-level engineers in industry, the military, government, or other fields.
2. Enter graduate schools in the disciplines of civil engineering or closely related areas, work training programs, self-study programs, military service schools, as well as other areas such as business schools.
3. Continue the process of life-long learning as required for long-term personal and professional growth.
4. Use their communication, computer, and teamwork skills to help themselves and their employees succeed.
5. Recognize their professional and ethical responsibilities to society as members of the professional engineering community.
6. Relate their personal and professional lives to moral and ethical practices.

The CEE program's student outcomes are taken directly from the 11 ABET program outcomes (a) through (k). By fulfilling the curriculum requirements for a B.S. degree in Civil Engineering, the department's graduates will attain the following:

a. an ability to apply knowledge of mathematics, science, and engineering;
b. an ability to design and conduct experiments, as well as to analyze and interpret data;
c. an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability;
d. ability to function on multi-disciplinary teams;
e. an ability to identify, formulate, and solve engineering problems;
f. an understanding of professional and ethical responsibility;

g. an ability to communicate effectively;
h. a broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context;
i. a recognition of the need for, and an ability to engage in, life-long learning;
j. a knowledge of contemporary issues;
k. an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Minimum Competency

All VMI academic departments require a minimum 2.0 GPA in the major as a requirement for graduation.

Transfer Credits

The CEE Department may, on a case by case basis, accept transfer credits for civil engineering courses completed at other institutions.

FE Exam

All CEE cadets are required to take the Fundamentals of Engineering (FE) exam. The curriculum has a FE review course available for cadets to take. Passing the FE exam is important to future career advancement in CE, as the exam represents the first step in registration as a professional engineer. The CEE Department uses the FE exam as a significant component of its outcomes assessment process, and to support ABET accreditation. Fundamentals of Engineering exam preparation and professional registration are emphasized in nearly every CEE course beginning in the first semester and continuing to graduation.

Professional Activities

The VMI Student Chapter of the American Society of Civil Engineers (ASCE) serves as the focal point of professional activities for our cadets. Eligible CEE cadets are inducted into the national engineering honor society, Tau Beta Pi, which recognizes cadets for academic excellence and leadership characteristics. The CEE Department also sponsors an Engineers Without Borders (EWB) chapter and a local timber framers project.

High School Preparation

Applicants considering CE as a choice of major may best prepare in high school by taking the full college preparatory program augmented by as many mathematics and science courses as their schedules permit. Courses in pre-calculus and calculus are particularly important.

Civil and Environmental Engineering Enrollment and Graduation Data

Civil Engineering	**Academic Year**								
	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Undergraduate Cadets Enrolled in Civil Engineering*	158	150	168	196	236	245	250	223	223
BS Degrees Awarded in Civil Engineering**	35	36	21	39	57	56	70	61	59

*Fall Census
**July 1-June 30

Major in Civil and Environmental Engineering

Civil Engineering, B.S.

Civil Engineering, B.S.
Suggested Course Selection for Civil Engineering Subdiscipline Concentrations
DE = Design Elective
TE = Technical Elective
ESE = Engineering Science Elective (I, II)
NSE = Natural Science Elective

Construction Management

CE 302—Civil Engineering Dynamics Credit Hours: 3 (ESEI)
CE 350—Civil Engineering Project Management Credit Hours: 3 (required)
CE 403—Foundations Credit Hours: 3 (DE)
CE 436—Transportation Planning and Design Credit Hours: 3 (DE)
CE 437—Construction Methods and Management Credit Hours: 3 (TE)
GE 306—Engineering Geology Credit Hours: 4 (NSE)
1 open Engineering Science Elective II
2 open Technical Electives or Independent Research

Environmental Engineering

BI 101—General Biology I Credit Hours: 4 (NSE)
CE 321—Environmental Engineering Credit Hours: 3 (required)
CE 408—Hydraulic Engineering Credit Hours: 3 (DE)
CE 412—Environmental Engineering Chemistry Credit Hours: 3 (ESE I, II)
CE 415—Environmental Engineering Unit Process Design Credit Hours: 3 (DE)
3 open Technical Electives or Independent Research

Fluid Mechanics & Hydraulic Engineering

CE 302—Civil Engineering Dynamics Credit Hours: 3 (ESE I)
CE 309—Fluid Mechanics Credit Hours: 3 (required)
CE 319W—Water Resources Laboratory Credit Hours: 1 (required)
CE 322—Water Resources Engineering Credit Hours: 3 (required)
CE 401—Hydrology Credit Hours: 3 (ESE II)
CE 404—Advanced Mechanics of Fluids Credit Hours: 3 (ESE II)
CE 408—Hydraulic Engineering Credit Hours: 3 (DE)
1 open Natural Science Elective
1 open Design Elective
2 open Technical Electives or Independent Research

Geotechnical Engineering

CE 302—Civil Engineering Dynamics Credit Hours: 3 (ESE I)
CE 310—Soil Mechanics Credit Hours: 4 (required)
CE 403—Foundations Credit Hours: 3 (DE)
CE 428—Topics in Structural Design Credit Hours: 3 (DE)
GE 306—Engineering Geology Credit Hours: 4 (NSE)
3 open Technical Electives or Independent Research
1 open Engineering Science II elective

Hydrology & Water Resourcers Engineering

BI 101—General Biology I Credit Hours: 4 (NSE)
CE 322—Water Resources Engineering Credit Hours: 3 (required)
CE 401—Hydrology Credit Hours: 3 (ESE II)
CE 408—Hydraulic Engineering Credit Hours: 3 (DE)
CE 412—Environmental Engineering Chemistry Credit Hours: 3 (ESE I)
CE 415—Environmental Engineering Unit Process Design Credit Hours: 3 (DE)
2 open Technical Electives or Independent Research

Structural Engineering

CE 302—Civil Engineering Dynamics Credit Hours: 3 (ESE I)
CE 327—Reinforced Concrete Design Credit Hours: 3 (required)
CE 402—Structural Mechanics Credit Hours: 3 (ESE II)
CE 405—Wood Engineering Credit Hours: 3 (DE)
CE 423—Structural Steel Design Credit Hours: 3 (DE)
CE 428—Topics in Structural Design Credit Hours: 3 (DE)
CE 429—Advanced Structural Theory Credit Hours: 3 (TE)
GE 306—Engineering Geology Credit Hours: 4 (NSE)
1 open Technical Electives or Independent Research

Transportation & Planning Engineering

CE 302—Civil Engineering Dynamics Credit Hours: 3 (ESE I)
CE 333—Transportation Engineering Credit Hours: 3 (required)
CE 401—Hydrology Credit Hours: 3 (ESE II)
CE 436—Transportation Planning and Design Credit Hours: 3 (DE)
CE 437—Construction Methods and Management Credit Hours: 3 (TE)
GE 306—Engineering Geology Credit Hours: 4 (NSE)
1 Design Elective
2 open Technical Electives or Independent Research

The technical electives selected from within the Civil and Environmental Engineering Department must meet the following distribution requirements:

6 credits of Design Elective from

CE 403—Foundations Credit Hours: 3
CE 405—Wood Engineering Credit Hours: 3
CE 408—Hydraulic Engineering Credit Hours: 3
CE 415—Environmental Engineering Unit Process Design Credit Hours: 3
CE 423—Structural Steel Design Credit Hours: 3
CE 428—Topics in Structural Design Credit Hours: 3
CE 436—Transportation Planning and Design Credit Hours: 3

4 credits of Natural Science Elective from

GE 306—Engineering Geology Credit Hours: 4
BI 101—General Biology I Credit Hours: 4
or another 4 hour science course

3 credits of Engineering Science Elective I from

CE 302—Civil Engineering Dynamics Credit Hours: 3
CE 330—Thermodynamics, Heat Transfer, and Electrical Circuits Credit Hours: 3
CE 412—Environmental Engineering Chemistry Credit Hours: 3
ME 311—Thermodynamics I Credit Hours: 3
EE 351—Electrical Circuits and Machines Credit Hours: 3
approved CH or PY 300 or 400 level courses

3 credits of Engineering Science Elective II from

CE 401—Hydrology Credit Hours: 3
CE 402—Structural Mechanics Credit Hours: 3
CE 404—Advanced Mechanics of Fluids Credit Hours: 3
CE 412—Environmental Engineering Chemistry Credit Hours: 3
CE 429—Advanced Structural Theory Credit Hours: 3
other EE and ME 300 or 400 level courses

12 credits of other technical electives from above or

CE 416—Fundamentals of Engineering Credit Hours: 3
CE 437—Construction Methods and Management Credit Hours: 3
CE 443—Independent Research Credit Hours: 3
CE 455-460
CE 461—Independent Summer Research Credit Hours: 1-3

Synopsis of the B.S. Curriculum in Civil Engineering

Fourth (Freshman) Class First Semester

CE 121—Surveying Credit Hours: 3
CE 109—CE Fundamentals I Credit Hours: 2
ERH 101—Writing and Rhetoric I Credit Hours: 3 *
HI 103—World History I Credit Hours: 3
MA 123—Calculus & Analytic Geometry I Credit Hours: 3 *
PE 102—Boxing Credit Hours: 0.5
or
PE 105—Wellness Concepts Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 15.5

Second Semester

CE 110—CE Fundamentals II Credit Hours: 2
CH 137—Introductory College Chemistry I Credit Hours: 3
CH 117—Laboratory for CH 137 Credit Hours: 1
ERH 102—Writing and Rhetoric II Credit Hours: 3 *
HI 104—World History II Credit Hours: 3
MA 124—Calculus & Analytic Geometry II Credit Hours: 3 *
PE 102—Boxing Credit Hours: 0.5
or
PE 105—Wellness Concepts Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 16.5

Third (Sophomore) Class First Semester

CE 203—Statics Credit Hours: 3 *
CE ELEC—Natural Science (GE 306 or BI 101) Credit Hours: 4
MA 215—Calculus With Analytic Geometry III Credit Hours: 4
PY 160—General Physics I Credit Hours: 3
PY 155—General Physics Laboratory I Credit Hours: 1
ERH 103—Fundamentals of Public Speaking Credit Hours: 1
PE 101—Basic Swimming and Survival Credit Hours: 0.5
or

PE 300—Principles of Physical Conditioning Credit Hours: 1
ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 17.5-18

Second Semester

CE 206—Solid Mechanics Credit Hours: 3 *
MA 220—Probability & Statistics for Engineers & Scientists Credit Hours: 3
MA 311—Elementary Differential Equations Credit Hours: 3
PS 344—Leadership in Organizations Credit Hours: 3
PY 161—General Physics II Credit Hours: 3
PY 156—General Physics Laboratory II Credit Hours: 1
PE 101—Basic Swimming and Survival Credit Hours: 0.5
or
PE 300—Principles of Physical Conditioning Credit Hours: 1
ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 17.5-18

Second (Junior) Class First Semester

CE 301—Structural Theory Credit Hours: 3
CE 309—Fluid Mechanics Credit Hours: 3
CE 310—Soil Mechanics Credit Hours: 4
CE 321—Environmental Engineering Credit Hours: 3
CE ELEC—Engineering Science Elective I Credit Hours: 3 **
PE Requirement—Elective Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 18.5

Second Semester

CE 307—Properties of Engineering Materials Credit Hours: 3
CE 319W—Water Resources Laboratory Credit Hours: 1
CE 322—Water Resources Engineering Credit Hours: 3
CE 327—Reinforced Concrete Design Credit Hours: 3
CE 333—Transportation Engineering Credit Hours: 3
CE 350—Civil Engineering Project Management Credit Hours: 3
PE Requirement—Elective Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 18.5

First (Senior) Class First Semester

CE 451W—Civil Engineering Seminar Credit Hours: 1
CE ELEC—Design Elective Credit Hours: 3
CE ELEC—Engineering Science Elective II Credit Hours: 3
CE ELEC—Technical Elective Credit Hours: 3
ELEC Humanities—Humanities Elective Credit Hours: 3
ELEC Free—Free Elective Credit Hours: 3
PE Requirement—Elective Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 18.5

Second Semester

CE 448—Civil Engineering Design Capstone Credit Hours: 3
CE ELEC—Design Elective Credit Hours: 3
CE ELEC—Technical Elective Credit Hours: 3
CE ELEC—Technical Elective Credit Hours: 3
ELEC Humanities—Humanities Elective Credit Hours: 3
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 17
Total Hours: minimum 140
* Minimum Grade of C Required
**Elective Options—CE 302, CE 330, CE 412, ME 311, EE 351

Computer and Information Sciences

The Department of Computer and Information Sciences offers a major leading to a B.S. degree in computer science. The aims of the department in training majors are:

1. **Technical Competency** Graduates will be able to apply their technical knowledge and skills to develop and implement computer solutions to achieve goals important to the industry, civilian or military components of government, or the research area in which they work. They will understand the capabilities and potentials of hardware and software, the relevance of theory, and the importance of networks, information security, information organization, information design and human computer interactions.
2. **Professionalism** Graduates will have professional and ethical attitudes that foster immediate employment and for developing careers in both the civilian workplace and for military duty. These include a desire for continuing intellectual and professional growth as well as an awareness of ethics and the impact of computers on society.
3. Communication and Interpersonal Skills Graduates will have communicative skills to function effectively in the civilian or military workplace and in society at large. They will have experience and expertise in working in teams and be able to provide leadership in their workplace organizations.

Each new cadet is assigned a departmental advisor who provides the necessary guidance and support throughout the Cadetship.

The computer science curriculum was revised effective the class of 2022. Please note all descriptions to assure correct offerings are scheduled based on matriculation program.

Major in Computer and Information Sciences

» Computer Science, B.S.

Minor in Computer and Information Sciences

» Computer and Information Sciences Minor
» Cybersecurity Minor

Computer Science, B.S.

The degree in computer and information sciences requires 137 semester hours which includes a minimum of 48 semester hours of computer and information sciences courses. A minimum 2.00 GPA must be maintained in the computer and information sciences courses. The following outline gives minimum requirements. Additional courses to complete the requirements must be chosen by the cadet with the approval of his/her department advisor. No single course may be used to satisfy requirements in two major areas.

Recommended Minors: Business, Psychology, Applied Mathematics, or Computer Engineering.

Major Required Courses: 48 credits

The following courses are required:

CIS 101—Introduction to Computer Science Credit Hours: 3
CIS 111—Programming I Credit Hours: 3
CIS 111L—Laboratory for Programming I Credit Hours: 1
CIS 112—Programming II Credit Hours: 3
CIS 112L—Laboratory for Programming II Credit Hours: 1
CIS 131—Introduction to Information Science Credit Hours: 3
CIS 201—Computer Architecture and Organization Credit Hours: 3
CIS 211—Internet and Mobile Programming Credit Hours: 3
CIS 301—Networking Credit Hours: 3
CIS 301L—Networking Lab Credit Hours: 1
CIS 302—Modern Operating Systems Credit Hours: 3
CIS 303—Computer & Information Security Credit Hours: 3
CIS 312W—Software Engineering Credit Hours: 3
CIS 313—Data Structures and Applications Credit Hours: 3
CIS 322—Database Management Systems Credit Hours: 3
CIS 331—Human Computer Interaction Credit Hours: 3
CIS 390—Pre-Capstone Credit Hours: 3
CIS 490—Capstone Credit Hours: 3

Major Required Courses (Mathematics): 15 credits

MA 101—Math that Matters I Credit Hours: 3
or
MA 123—Calculus & Analytic Geometry I Credit Hours: 3
MA 102—Math that Matters II Credit Hours: 3
or
MA 124—Calculus & Analytic Geometry II Credit Hours: 3
CIS 241—Discrete Structures Credit Hours: 3
CIS 342—Data Analytics Credit Hours: 3
CIS 442—Design and Analysis of Algorithms Credit Hours: 3

Major Required Courses (Science): 15 credits

ELEC MA/SC—Mathematics or Science Elective Credit Hours: 4
ELEC MA/SC—Mathematics or Science Elective Credit Hours: 3
ELEC Science—Science Elective Credit Hours: 4
ELEC Science—Science Elective Credit Hours: 3

Major Electives: 12 credits (CIS 231WX and/or 300 Level or above) and Free Electives: 12 Credits

Four major departmental elective courses required. The courses may include CIS 231WX and any 300 level or above courses. Four free electives to provide sufficient opportunities for minors in other departments as well as completion of Civilizations and Cultures course requirements. The following are the list of acceptable CIS major elective courses:

CIS 231WX—IT:Past, Present, and Future Credit Hours: 3
CIS 401—Advanced Network Security Credit Hours: 3
CIS 402—Computer Forensics Credit Hours: 3
CIS 411—Web Development Credit Hours: 3
CIS 412—Mobile Programming Credit Hours: 3
CIS 421—Database Design and Development Credit Hours: 3
CIS 422—Information Retrieval Credit Hours: 3
CIS 424—Artificial Intelligence Credit Hours: 3
CIS 431—Information Organization & Management Credit Hours: 3
CIS 432—Computer Vision Credit Hours: 3
CIS 433—Usability Analysis Credit Hours: 3
CIS 434—Bioinformatics Credit Hours: 3

Synopsis of the B.S. Curriculum in Computer and Information Sciences

Fourth (Freshman) Class First Semester

CIS 101—Introduction to Computer Science Credit Hours: 3 *
CIS 111—Programming I Credit Hours: 3 *
CIS 111L—Laboratory for Programming I Credit Hours: 1
ERH 101—Writing and Rhetoric I Credit Hours: 3 *
HI 103—World History I Credit Hours: 3
MA 101—Math that Matters I Credit Hours: 3
or
MA 123—Calculus & Analytic Geometry I Credit Hours: 3
PE 105—Wellness Concepts Credit Hours: 0.5
or
PE 102—Boxing Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 17.5

Second Semester

CIS 112—Programming II Credit Hours: 3 *
CIS 112L—Laboratory for Programming II Credit Hours: 1
CIS 131—Introduction to Information Science Credit Hours: 3 *
ERH 102—Writing and Rhetoric II Credit Hours: 3 *
HI 104—World History II Credit Hours: 3
MA 102—Math that Matters II Credit Hours: 3
or
MA 124—Calculus & Analytic Geometry II Credit Hours: 3
PE 105—Wellness Concepts Credit Hours: 0.5
or
PE 102—Boxing Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 17.5

Third (Sophomore) Class First Semester

CIS 201—Computer Architecture and Organization Credit Hours: 3 *
CIS 211—Internet and Mobile Programming Credit Hours: 3
CIS 241—Discrete Structures Credit Hours: 3
Science Requirement—(BI, CH, or PY w/ lab) Credit Hours: 4
PS 201—Introduction to Psychology Credit Hours: 3
or
PS 313—Forensic Psychology Credit Hours: 3
PE 101—Basic Swimming and Survival Credit Hours: 0.5
or
PE 300—Principles of Physical Conditioning Credit Hours: 1
ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 17.5-18

Second Semester

CIS 313—Data Structures and Applications Credit Hours: 3 *
CIS 322—Database Management Systems Credit Hours: 3 *
CIS 331—Human Computer Interaction Credit Hours: 3 *
Science Requirement—(BI, CH, or PY w/ lab) Credit Hours: 4
ELEC Free—Free Elective Credit Hours: 3
PE 101—Basic Swimming and Survival Credit Hours: 0.5
or
PE 300—Principles of Physical Conditioning Credit Hours: 1
ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 17.5-18

Second (Junior) Class First Semester

CIS 301—Networking Credit Hours: 3 *
CIS 301L—Networking Lab Credit Hours: 1
CIS 302—Modern Operating Systems Credit Hours: 3
CIS 312W—Software Engineering Credit Hours: 3
ERH 103—Fundamentals of Public Speaking Credit Hours: 1
ELEC MA/SC—Mathematics or Science Elective Credit Hours: 4
PE Requirement—Elective Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 17.5

Second Semester

CIS 303—Computer & Information Security Credit Hours: 3
CIS 342—Data Analytics Credit Hours: 3
CIS 442—Design and Analysis of Algorithms Credit Hours: 3
PS 344—Leadership in Organizations Credit Hours: 3
ELEC MA/SC—Mathematics or Science Elective Credit Hours: 3
PE Requirement—Elective Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 17.5

First (Senior) Class First Semester

CIS 390—Pre-Capstone Credit Hours: 3
ELEC CIS—Computer & Informations Sciences Elective Credit Hours: 3
ELEC CIS—Computer & Information Sciences Elective Credit Hours: 3
ELEC Free—Free Elective Credit Hours: 3
ELEC Free—Free Elective Credit Hours: 3
PE Requirement—Elective Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 17.5

Second Semester

CIS 490—Capstone Credit Hours: 3
ELEC CIS—Computer & Information Sciences Elective Credit Hours: 3
ELEC CIS—Computer & Informations Sciences Elective Credit Hours: 3
ELEC Free—Free Elective Credit Hours: 3
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 14
Total Hours: minimum 137
*Minimum Grade of "C" required

Economics and Business

The curriculum in economics and business leads to the bachelor of arts degree. The major is designed to provide an understanding of the economic system and the function of business enterprise in the economy. It includes many courses common to other liberal arts curricula, with the aim of developing the cadet's ability to think critically about society's economic issues. In particular, the curriculum features an emphasis on developing analytical tools and methods of both public economic policy and business decision making.

As one of VMI's liberal arts curricula, economics and business is based on a foundation of studies in mathematics, languages, social sciences, and humanities. In addition to the core curriculum requirements listed on page 15, cadets must also take core curriculum courses as listed on the next page (9 hours of humanities or social science electives, plus 12 hours of one foreign language through the 200-level). The curriculum provides a broadly conceived liberal arts education and is an excellent preparation for a wide range of business pursuits, military service, or graduate studies in economics, business, or law.

The department sponsors several extracurricular activities in support of the academic program. These include the visiting scholars' programs under the Northen and Conquest Chair endowments, the VMI chapter of Omicron Delta Epsilon (the international honor society in economics), the VMI chapter of Beta Gamma Sigma (the international honor society in business), the Cadet Investment Group that affords actual experience in securities investments, and the Entrepreneurship Club.

The department provides a robust internship program, coordinated through the efforts of an Internship Coordinator. Academic credit for internships is also available.

Three awards, the Roberts Medal, the Wheat Medal, and the Philpott Medal, recognize the top graduating seniors in economics and business studies. Academic Excellence Awards are presented annually to the top members of the upper three classes.

The Andrew L. McDowell Scholarship is available to cadets majoring in economics and business. It is based primarily on academic excellence, although other factors such as need, character, extracurricular activities, and leadership may be considered. Call for applications for this scholarship is sent out during the spring semester, for awards to be made the following academic year.

Major in Economics and Business

» Economics and Business, B.A.

Concentrations in Economics and Business

» Financial Management Concentration
» Global Management Concentration

Minors in Economics and Business

» Business Minor
» Economics Minor

Economics and Business, B.A.

Synopsis of the B.A. Curriculum in Economics and Business

Fourth (Freshman) Class First Semester

Science Requirement—Core Credit Hours: 4 (Biology or Chemistry w/ lab)
ERH 101—Writing and Rhetoric I Credit Hours: 3 *
HI 103—World History I Credit Hours: 3
MA 101—Math that Matters I Credit Hours: 3 *
ELEC Foreign Language—Foreign Language Elective Credit Hours: 3
PE 102—Boxing Credit Hours: 0.5
or
PE 105—Wellness Concepts Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 17.5

Second Semester

Science Requirement—Core Credit Hours: 4 (Biology or Chemistry w/ lab)
ERH 102—Writing and Rhetoric II Credit Hours: 3 *
HI 104—World History II Credit Hours: 3
MA 102—Math that Matters II Credit Hours: 3 *
ELEC Foreign Language—Foreign Language Elective Credit Hours: 3
PE 102—Boxing Credit Hours: 0.5
or
PE 105—Wellness Concepts Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 17.5

Third (Sophomore) Class First Semester

EC 201—Principles of Microeconomics Credit Hours: 3 *
BU 210—Financial Accounting Credit Hours: 3 *
BU 220—Principles of Management Credit Hours: 3 *
ELEC Humanities—Humanities Elective Credit Hours: 3
ELEC Foreign Language—Foreign Language Elective Credit Hours: 3
PE 101—Basic Swimming and Survival Credit Hours: 0.5
or
PE 300—Principles of Physical Conditioning Credit Hours: 1
ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 16.5-17

Second Semester

EC 202—Principles of Macroeconomics Credit Hours: 3 *
BU 211—Managerial Accounting Credit Hours: 3 *
BU 230—Principles of Marketing Credit Hours: 3 *
PS 344—Leadership in Organizations Credit Hours: 3
ELEC Foreign Language—Foreign Language Elective Credit Hours: 3
ERH 103—Fundamentals of Public Speaking Credit Hours: 1
PE 101—Basic Swimming and Survival Credit Hours: 0.5
or
ROTC Requirement—AS, MS, or NS Credit Hours: 1
PE 300—Principles of Physical Conditioning Credit Hours: 1
Total Semester Hrs: 17.5-18

Second (Junior) Class First Semester

EC 300—Intermediate Microeconomics Credit Hours: 3 *
EC 303—Statistics Credit Hours: 3 *
BU 310—Business Finance Credit Hours: 3 *
BU 339—Operations Management Credit Hours: 3 *
ELEC Humanities—Humanities Elective Credit Hours: 3
PE Requirement—Elective Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 17.5

Second Semester

EC 330—Intermediate Macroeconomics Credit Hours: 3 *
EC 304—Econometrics Credit Hours: 3 *
BU 330—Management Information Systems Credit Hours: 3
BU ELEC—Business Elective Credit Hours: 3
ELEC Humanities—Humanities Elective Credit Hours: 3
PE Requirement—Elective Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 17.5

First (Senior) Class First Semester

BU 316—Legal Environment of Business Credit Hours: 3 *
BU ELEC—Business Elective Credit Hours: 3
EC ELEC—Economics Elective Credit Hours: 3
EC ELEC—Economics Elective Credit Hours: 3
ELEC Free—Free Elective Credit Hours: 3
PE Requirement—Elective Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 17.5

Second Semester

BU 440—Business Policy Seminar Credit Hours: 3 *
BU ELEC—Business Elective Credit Hours: 3
EC ELEC—Economics Elective Credit Hours: 3
EC ELEC—Economics Elective Credit Hours: 3
ELEC Free—Free Elective Credit Hours: 3
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 17

Total Hours: minimum 139
*Minimum Grade of C required

All required economics and business courses must be taken at VMI. Any course not taken at VMI must be approved, before taking the course, by the department head.

For all economics and business courses taken in this curriculum, a minimum of 2.0 average must be attained.

The following courses must be completed with a grade of C or higher:

BU 210—Financial Accounting Credit Hours: 3
BU 211—Managerial Accounting Credit Hours: 3
BU 220—Principles of Management Credit Hours: 3
BU 230—Principles of Marketing Credit Hours: 3
BU 310—Business Finance Credit Hours: 3
BU 316—Legal Environment of Business Credit Hours: 3
BU 330—Management Information Systems Credit Hours: 3
BU 339—Operations Management Credit Hours: 3
BU 440—Business Policy Seminar Credit Hours: 3
EC 201—Principles of Microeconomics Credit Hours: 3
EC 202—Principles of Macroeconomics Credit Hours: 3
EC 300—Intermediate Microeconomics Credit Hours: 3
EC 303—Statistics Credit Hours: 3
EC 304—Econometrics Credit Hours: 3
EC 330—Intermediate Macroeconomics Credit Hours: 3
MA 101—Math that Matters I Credit Hours: 3
MA 102—Math that Matters II Credit Hours: 3
ERH 101—Writing and Rhetoric I Credit Hours: 3
ERH 102—Writing and Rhetoric II Credit Hours: 3

Electrical and Computer Engineering

Consider these questions:

» Are you interested in learning how technology improves our quality of life?
» Are you intrigued by high-tech gadgets?
» Do you enjoy working with computers?
» Now, what are you seeking from your VMI Academic Experience?
» Are small class sizes and readily-available professors important to you?
» Do you prefer an interactive, "hands-on" education with state-of-the-art laboratory equipment?
» Are you looking for a flexible curriculum that offers many elective course options?
» Are you interested in opportunities to enhance your education through undergraduate research activities and professional conference participation?
» Finally, what are your career aspirations?
» Are you interested in working in industry or with the government?
» Do you want to serve in the military?
» Are you considering graduate school and higher education opportunities?

If so, you should consider majoring in **Electrical and Computer Engineering!!**

Our philosophy is to provide the highest quality undergraduate education available, balancing a solid theoretical foundation with an equally strong practical training in the electrical and computer engineering discipline. We stress the importance of high-tech design and problem solving skills coupled with integrity and professionalism. Our wide diversity of course and laboratory offerings is complemented by opportunities to personalize your education through the selection of electives and independent studies. The Electrical and Computer Engineering program is accredited by the Engineering Accreditation Commission of ABET, *http://www.abet.org*.

Program Educational Objectives:

The department seeks to prepare graduates who, in a few years after graduation, have:

1. Established themselves in, and made contributions to, a professional career in industry, government, or the military, and/or are continuing their education in graduate school.
2. Remained current in their profession through continuing education, via the completion of graduate coursework, attainment of certifications, or maintenance of active professional licensure, or through personal self-study and/or on-the-job training as part of their career advancement.

In order to prepare students to meet these educational objectives, the Student Outcomes of the Electrical and Computer Engineering Department are listed below.

Student Outcomes:

(through the 2018-2019 ABET Cycle)

The department seeks to prepare students who, by the time of graduation, possess:

1. an ability to apply knowledge of mathematics, science, and engineering
2. an ability to design and conduct experiments, as well as to analyze and interpret data
3. an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, an sustainability
4. an ability to function on multidisciplinary teams
5. an ability to identify, formulate and solve engineering problems
6. an understanding of professional and ethical responsibility
7. an ability to communicate effectively
8. the broad education necessary to understand the impact of engineering solutions in global, economic, environmental, and societal context
9. a recognition of the need for, and an ability to engage in life-long learning
10. a knowledge of contemporary issues
11. an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Student Outcomes:

(beginning with the 2019-2020 ABET Cycle)

The department seeks to prepare students who, by the time of graduation, possess:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies

Electrical and Computer Engineering Program of Study

In order to meet these goals, the Electrical and Computer Engineering Department has designed a program of study to prepare you for a rewarding and successful career. To give you the most flexibility after you graduate from our program, our courses provide a broad foundation in many areas of electrical and computer engineering. For those students seeking additional specialization in a particular area, the Electrical and Computer Engineering Department offers a variety of elective courses, as well as customized independent research courses that are tailored to the specific interests of the students and faculty. The program of study culminates with a capstone design experience that includes a competition with design teams from other colleges and universities in the southeastern U.S.

ECE Mathematics Preparation Policy

VMI ECE majors must take Calculus I (MA 123) or higher in the first semester by:

» Passing the VMI math placement test or retest (given in the summer before matriculation)
» Passing MA 114 (Precalculus) in STP (before matriculation)
» Achieving a score of 3 or higher on the AP Calculus test (either AB or BC)
» Passing an equivalent precalculus course at another school before matriculation (requires VMI math department head approval)

Professional Licensure

The ECE Department encourages all electrical and computer engineering (ECE) cadets to take and pass the Fundamentals of Engineering (FE) Examination as an early step toward licensure as a professional engineer.

The FE Examination is offered several times each year at a number of testing locations.

ECE cadets who pass the FE Examination may present documentation to the ECE Secretary for reimbursement for one exam fee.

Math/Science Electives

ECE cadets should consult with their academic advisor or department head concerning approved math/science electives. X- and W- designated math/science courses are not acceptable, nor are math/science courses already required within the ECE program of study. In addition, math/science courses deemed to be equivalent to, or at a lower level than, math/science content already included in the ECE program of study are not acceptable.

Honors in Electrical and Computer Engineering

Eligibility:

» Students may apply to the ECE Honors Program no earlier than the beginning of their third class year. The application form must be completed and submitted to the Registrar's Office through the ECE Department Head.
» Applicants must have a minimum cumulative GPA of 3.00 and a minimum ECE GPA of 3.30.

Requirements:

» Students must maintain a minimum cumulative GPA of 3.00 and a minimum ECE GPA of 3.30 in order to remain in the ECE Honors Program and be eligible for ECE Honors upon graduation.
» Students must submit an honors thesis proposal to the ECE Department Head no later than the end of the second class year. The honors thesis proposal must include the following:
  › A description of the project
  › Approval of the project advisor(s)
» Students must complete (with no grades below B) a minimum of 3 hours of Undergraduate Research in ECE (EE 491-496) or ECE Internship for Credit (EE 469).
» Students must present the results of their work in an external professional forum, such as IEEE, NCUR, ASEE, etc.
» At the conclusion of their project, but no later than one week before the end of classes that semester, students must submit their final honors thesis to their project advisor(s) and the ECE Department Head for approval.

Scholarship and Internship Opportunities

Numerous Scholarship and Internship Opportunities are available to cadets majoring in Electrical and Computer Engineering! Contact the ECE Department Head, or visit the departmental web site: *www.vmi.edu/elen*, for up-to-date information.

Transfer Policies

Electrical and computer engineering courses, including online courses, may be transferred to VMI pending an evaluation of equivalency and approval by the ECE Department Head.

Electrical and Computer Engineering Enrollment and Graduation Data

Electrical and Computer Engineering	**Academic Year**								
	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Undergraduate Cadets Enrolled in ECE*	44	48	59	48	47	51	62	64	78
BS Degrees Awarded in ECE**	11	8	6	9	7	13	7	7	14

*Fall Census
**July 1-June 30

Major in Electrical and Computer Engineering

» Electrical and Computer Engineering, B.S.

Minor in Electrical and Computer Engineering

» Computer Engineering Minor

Electrical and Computer Engineering, B.S.

Synopsis of the B.S. Curriculum in Electrical and Computer Engineering

Fourth (Freshman) Class First Semester

EE 110—Introduction to Electrical & Computer Engineering Credit Hours: 2
EE 120—Computer Tools in Electrical And Computer Engineering Credit Hours: 3
EE 140—C Programming Credit Hours: 3
MA 123—Calculus & Analytic Geometry I Credit Hours: 3 *
ERH 101—Writing and Rhetoric I Credit Hours: 3 *
PE 102—Boxing Credit Hours: 0.5
or
PE 105—Wellness Concepts Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 15.5

Second Semester

EE 122—DC Circuits Credit Hours: 3 *
EE 129—Introduction to Digital Logic Circuits Credit Hours: 3 *
EE 142—C++ & Object Oriented Programming Credit Hours: 3
MA 124—Calculus & Analytic Geometry II Credit Hours: 3 *
ERH 102—Writing and Rhetoric II Credit Hours: 3 *
PE 102—Boxing Credit Hours: 0.5
or
PE 105—Wellness Concepts Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 16.5

Third (Sophomore) Class First Semester

EE 223—Electrical Circuit Analysis Credit Hours: 4
EE 228—Digital Systems Design Credit Hours: 3
ERH 103—Fundamentals of Public Speaking Credit Hours: 1
MA 215—Calculus With Analytic Geometry III Credit Hours: 4
PY 155—General Physics Laboratory I Credit Hours: 1
PY 160—General Physics I Credit Hours: 3

PE 101—Basic Swimming and Survival Credit Hours: 0.5
or
PE 300—Principles of Physical Conditioning Credit Hours: 1
ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 17.5-18

Second Semester

EE 221—Discrete Mathematics Credit Hours: 3
EE 230—Signal and System Analysis Credit Hours: 3
EE 255—Electronics Credit Hours: 3
MA 311—Elementary Differential Equations Credit Hours: 3
PY 156—General Physics Laboratory II Credit Hours: 1
PY 161—General Physics II Credit Hours: 3
PE 101—Basic Swimming and Survival Credit Hours: 0.5
or
PE 300—Principles of Physical Conditioning Credit Hours: 1
ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 17.5-18

Second (Junior) Class First Semester

ECE ELEC—Electrical & Computer Engineering Elective Credit Hours: 3
ECE ELEC—Electrical & Computer Engineering Elective Credit Hours: 3
MA-SCI/FREE ELEC—3 Credit Hours: **
HI 103—World History I Credit Hours: 3
PS 344—Leadership in Organizations Credit Hours: 3
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 17

Second Semester

ECE ELEC—Electrical & Computer Engineering Elective Credit Hours: 3
ECE ELEC—Electrical & Computer Engineering Elective Credit Hours: 3
MA 220—Probability & Statistics for Engineers & Scientists Credit Hours: 3
HI 104—World History II Credit Hours: 3
MA-SCI/FREE ELEC—3 Credit Hours: **
PE Requirement—Elective Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 17.5

First (Senior) Class First Semester

ECE ELEC—Electrical & Computer Engineering Elective Credit Hours: 3
ECE ELEC—Electrical & Computer Engineering Elective Credit Hours: 3
ECE ELEC—Electrical & Computer Engineering Elective Credit Hours: 3
EE 421X—Systems Design I Credit Hours: 3
MA-SCI/FREE ELEC—3 Credit Hours: **
PE Requirement—Elective Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 17.5

Second Semester

ECE ELEC—Electrical & Computer Engineering Elective Credit Hours: 3
ECE ELEC—Electrical & Computer Engineering Elective Credit Hours: 3
ECE ELEC—Electrical & Computer Engineering Elective Credit Hours: 3
EE 471W—System Design Validation Credit Hours: 3
MA-SCI/FREE ELEC—3 Credit Hours: **
PE Requirement—Elective Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 17.5
Total Hours: minimum 137
*Minimum Grade of C Required.
**MA-SCI/FREE—3 of the 12 Math/Science or Free Elective Credits must be an approved math or science elective. The other 9 credits must include all remaining (X) Civilizations & Cultures and (W) Writing Intensive course requirements.

English, Rhetoric, and Humanistic Studies

English Major

The mission of the English major at VMI is to prepare the citizen-soldier for civic and professional life through disciplined engagement with rhetorical traditions and applications, from the classical to the contemporary. Grounded in a common interest in the varied functions of language, the major integrates multiple disciplinary approaches, including the literary, the philosophical, and the aesthetic. Cadets' command of language is developed both critically and creatively through the study of a range of humanistic works and practice in effective forms of expression.

Rhetoric is both an art and a skill in using language, a means of fostering cooperation among human beings. In this definition "language" encompasses the language of music, art, and philosophy as well as of writing and literature. Through a study of these languages, cadets learn to create and interpret a variety of texts and locate them in their cultural contexts. In the process English majors discover how authors, artists, and philosophers have shaped and been shaped by the values, beliefs, time, and place in which they lived and worked. Cadets thus gain a cultural awareness that will serve them well in today's global society. Given the necessity of digital communication in the twenty-first century, they also learn how to navigate networked writing spaces and to develop multimedia projects for the web. To extend their education beyond the classroom and prepare them to be engaged citizens and professionals, they apply what they have learned to real-world situations in both courses and required internships.

To facilitate English majors' active engagement in their learning, classes in this department are kept small and individual mentoring is emphasized. Students therefore have ample opportunities to pursue individual projects in subjects of their own choosing, and those with particularly strong records are invited to undertake an Honors project in English. Sigma Tau Delta, the English Honor Society, sponsors a range of rich and varied activities that provide opportunities to extend classroom learning and enrich cultural knowledge.

Through both curricular and extracurricular experiences, graduates with this degree are thus well prepared to pursue careers in military service, law, business, civil service, technical and professional writing, education, communications, the arts, and a wide variety of other fields.

The Department of English, Rhetoric, and Humanistic Studies offers four minors for non-majors and four concentrations for majors: Art History and Visual Culture, Literary Studies, Philosophy, and Rhetoric and Writing.

Major in English, Rhetoric, and Humanistic Studies

» English, B.A.

Concentrations in English, Rhetoric, and Humanistic Studies

» Art History and Visual Culture Concentration
» Literary Studies Concentration
» Philosophy Concentration
» Rhetoric and Writing Concentration

Minors in English, Rhetoric, and Humanistic Studies

» Art History and Visual Culture Minor
» Literary Studies Minor
» Philosophy Minor
» Rhetoric and Writing Minor

English, B.A.

The degree in English requires 136 semester hours, which includes a minimum of 54 semester hours of English, Rhetoric, and Humanistic Studies (ERH) courses, 18 semester hours of additional requirements for the major, and 46 semester hours of Core Curriculum requirements. Additional courses to complete the requirements for graduation must be chosen by the cadet with the approval of his or her departmental adviser.

English majors may pursue concentrations in Rhetoric and Writing, Literary Studies, Philosophy, and Art History and Visual Culture.

Major Core: 36 Credits

ERH 201—Rhetorical Traditions I Credit Hours: 3
ERH 202—Rhetorical Traditions II Credit Hours: 3
ERH 203—Ways of Reading Credit Hours: 3
ERH 204—The Language of Art Credit Hours: 3
ERH 205—British Literary Traditions Credit Hours: 3
ERH 206—American Literary Traditions Credit Hours: 3
ERH 207—Ethics Credit Hours: 3
ERH 301—Rhetoric and Public Address Credit Hours: 3
ERH 302—Civic Discourse Credit Hours: 3
ERH 323—Philosophy and Literature Credit Hours: 3
ERH 411—Fieldwork Credit Hours: 3
ERH 481—Senior Capstone Course Credit Hours: 3

Major Electives: 18 Credits

Six major electives, at least one of which must be at the 400 level.

At least two electives (6 credits) must be selected from the following list of Rhetoric/Writing courses:
ERH 221—Digital Rhetorics Credit Hours: 3
ERH 250—Teaching Writing Credit Hours: 3
ERH 303—Cultural Rhetorics Credit Hours: 3
ERH 304—Language and Style Credit Hours: 3
ERH 311-313—Professional Writing (Discipline/Field Specific) Credit Hours: 3
ERH 314—Technical Communication Credit Hours: 3
ERH 470-479—Seminar in Rhetoric and Writing Credit Hours: 3

At least one elective (3 credits) must be selected from the following list of courses offering practice in creative expression:
ERH 222—Genre Studies—Poetry Credit Hours: 3
ERH 223—Genre Studies—Fiction Credit Hours: 3
ERH 224—Genre Studies—Nonfiction Credit Hours: 3
ERH 225—Visual Arts Studio Credit Hours: 3
ERH 470-479—Seminar in Rhetoric and Writing Credit Hours: 3

Additional Requirements: 18 Credits

12 credits through the 200 level: Foreign Language
3 Credits: World literature in translation; OR a 300-level course in MLC; or any Cultures and Civilization elective in any academic department other than English, Rhetoric and Humanistic Studies (ERH)
3 Credits: Computer and Information Sciences (CIS) elective

General Education Requirements: 46 credits

ERH 101—Writing and Rhetoric I Credit Hours: 3
ERH 102—Writing and Rhetoric II Credit Hours: 3
ERH 103—Fundamentals of Public Speaking Credit Hours: 1
MA 101—Math that Matters I Credit Hours: 3
MA 102—Math that Matters II Credit Hours: 3
HI 103—World History I Credit Hours: 3
HI 104—World History II Credit Hours: 3
Science Credit Hours: 8
Physical Education Credit Hours: 4
PS 344—Leadership in Organizations Credit Hours: 3
ROTC Credit Hours: 12
Free Electives: 18 credits

Synopsis of the B.A. Curriculum in English

Fourth (Freshman) Class First Semester

ERH 101—Writing and Rhetoric I Credit Hours: 3 *
HI 103—World History I Credit Hours: 3
MA 101—Math that Matters I Credit Hours: 3
ELEC Foreign Language—Foreign Language Elective Credit Hours: 3
Science Requirement—(BI, CH, or PY w/ lab) Credit Hours: 4
PE 102—Boxing Credit Hours: 0.5
or
PE 105—Wellness Concepts Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 17.5

Second Semester

ERH 102—Writing and Rhetoric II Credit Hours: 3 *
HI 104—World History II Credit Hours: 3
MA 102—Math that Matters II Credit Hours: 3
ELEC Foreign Language—Foreign Language Elective Credit Hours: 3

Science Requirement—(BI, CH, or PY w/ lab) Credit Hours: 4
PE 102—Boxing Credit Hours: 0.5
or
PE 105—Wellness Concepts Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 17.5

Third (Sophomore) Class First Semester

ERH 201—Rhetorical Traditions I Credit Hours: 3
ERH 204—The Language of Art Credit Hours: 3
ERH 205—British Literary Traditions Credit Hours: 3
ERH 207—Ethics Credit Hours: 3
ELEC Foreign Language—Foreign Language Elective Credit Hours: 3
PE 101—Basic Swimming and Survival Credit Hours: 0.5
or
PE 300—Principles of Physical Conditioning Credit Hours: 1
ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 16.5-17

Second Semester

ERH 103—Fundamentals of Public Speaking Credit Hours: 1
ERH 202—Rhetorical Traditions II Credit Hours: 3
ERH 203—Ways of Reading Credit Hours: 3
ERH 206—American Literary Traditions Credit Hours: 3
PS 344—Leadership in Organizations Credit Hours: 3
ELEC Foreign Language—Foreign Language Elective Credit Hours: 3
PE 101—Basic Swimming and Survival Credit Hours: 0.5
or
PE 300—Principles of Physical Conditioning Credit Hours: 1
ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 17.5-18

Second (Junior) Class First Semester

ERH 301—Rhetoric and Public Address Credit Hours: 3
ERH 302—Civic Discourse Credit Hours: 3
ELEC CIS—Computer & Information Sciences Elective Credit Hours: 3
ELEC Major—Major Elective Credit Hours: 3 (Rhetoric/Writing)
ELEC Major—Major Elective Credit Hours: 3 (Creative Expression)
PE Requirement—Elective Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 17.5

Second Semester

ERH 411—Fieldwork Credit Hours: 3
ELEC World—World Elective* Credit Hours: 3
ELEC Major—Major Elective Credit Hours: 3
ELEC Major—Major Elective Credit Hours: 3 (Rhetoric/Writing)
ELEC Free—Free Elective Credit Hours: 3
PE Requirement—Elective Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 17.5

First (Senior) Class First Semester

ERH 481—Senior Capstone Course Credit Hours: 3
ELEC Major—Major Elective Credit Hours: 3 (400-level)
ELEC Free—Free Elective Credit Hours: 3
ELEC Free—Free Elective Credit Hours: 3
ELEC Free—Free Elective Credit Hours: 3
PE Requirement—Elective Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 17.5

Second Semester

ERH 323—Philosophy and Literature Credit Hours: 3
ELEC Major—Major Elective Credit Hours: 3
ELEC Free—Free Elective Credit Hours: 3
ELEC Free—Free Elective Credit Hours: 3
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 14
Total Hours: minimum 136

* World literature in translation; OR a 300-level course in MLC; or any Cultures and Civilization elective in any academic department other than English, Rhetoric and Humanistic Studies (ERH)

History

The history curriculum is designed to produce men and women educated in the responsibilities of citizenship. It prepares cadets for graduate schools of history or government, and for occupations in which the ability to understand backgrounds, grasp issues, and manage affairs is essential, e.g., law, business, politics, government service, and the armed forces.

The curriculum, with proper electives, fully meets the requirements for admission to outstanding schools of law and graduate programs in business administration and management, as well as history. By concentrating electives in a specific subject area, cadets can acquire both the broad outlook offered by history and the specific outlook of other disciplines.

The cadet majoring in history receives, first of all, training in the natural sciences, mathematics, and the English language as an instrument of written and oral communication. Additionally the cadet learns a foreign language. History courses cover the principal fields of modern European, Middle Eastern, East Asian, Latin American, African, and American history. Rather than merely cataloguing events of the past, these courses emphasize an understanding of developments and problems, and they give attention to social, economic, and cultural phenomena, as well as political and constitutional problems.

As history majors advance through the curriculum, they apply the lessons of previous courses to challenging new subjects. Students in 100-level World History comprehend fundamental themes, issues, and trends in global history. Students in 200-level

United States history explore and analyze increasingly complex themes, issues, and trends in U.S. history. Students in 300-level courses develop a detailed knowledge of a specific field's major historical events and themes, and where appropriate acquire a functional understanding of relevant historical geography. Each level of the history curriculum is associated with a set of essential skills. Students in 100-level World History sharpen essential college-level skills such as note-taking, critical reading, and studying for both objective and analytical exams. Students in 200-level United States history interpret primary sources and base an argument on them, evaluate secondary sources, and cite sources. Students in 300-level courses evaluate the thesis and evidence in essential historical essays or books, and identify significant historiographical trends. In HI 200 and those 300-level courses designated as methodologically intensive, students learn the basic techniques of historical research, analysis and documentation. They employ common library and electronic research tools, and use book reviews or review essays to assess a field's major literature. In 400-level courses, students frame a research topic, locate and evaluate relevant primary and secondary evidence, and discuss relevant historiography.

The capstone course requirement ensures that all majors gain experience in historical methodology and writing. An Honors Program, open to majors who have demonstrated excellence in the study of history, and a Directed Study course offer opportunities to engage in more extensive research and write a paper under the close supervision of a faculty sponsor.

Honors in History

The Honors Program in History is open to majors who have demonstrated excellence in the study of history. History majors seeking honors in history must have completed the departmental core curriculum courses of HI 103, HI 104, HI 205 or 205W, and HI 206. The honors sequence consists of HI 372, HI 491W, and HI 492W.

Major in History

» History, B.A.

Concentrations in History

» Military History Concentration

Minors in History

» History Minor
» Middle Eastern Studies Minor
» Military History Minor

History, B.A.

History Curriculum Requirements

See the synopsis of the history curriculum below.

Institute Core Curriculum:

Note that ERH 101 and ERH 102 must be passed with a grade of C or better. The required core curriculum mathematics sequence may be filled with one of the following course sequences: MA 101/MA 102, MA 123/MA 124 or MA 125/MA 126. All VMI students are required to take two writing intensive courses, at least one of which must be within their major department. Listings of courses to be offered in each coming semester indicate writing-intensive courses with the suffix W following the course number.

Department of History Core Curriculum:

History majors and minors must earn a grade of C or better in the following courses: HI 103, HI 104, HI 205 or HI 205W and HI 206 . History majors must take at least thirty-six hours of history, including the eighteen required hours of HI 103, HI 104, HI 200, HI 205 or HI 205W, HI 206 and HI 460W . Please note that the Department of History will not accept Western Civilization courses as a substitute for World History Part I (HI 103). They can be transferred in only as history electives. Nor does the History Department allow transfer credit for internet-based or distance learning courses.

Introduction to Methodology:

History majors must take HI 200 "Introduction to Historical Methods," earning a grade of "C" or better as a prerequisite for one of the 300-level courses designated as methodologically intensive. Completion of at least one 300-level "M" course is a prerequisite to enrollment in HI 460W. Cadets completing this requirement must demonstrate ability to construct an annotated bibliography and to cite sources in accordance with departmental standards. Any methodological course may also fulfill a regional requirement.

Capstone Course:

History majors must take HI 460W, during their first class year. The history department may direct individuals to enroll in HI 460W in either fall or spring semester, however. The course requires a major research paper. Topics for the course will vary. (Note: individual sections of HI 460W may have special prerequisites.) Substitutions for HI 460W are rare but with prior approval by the department head, may be allowed for comparable work while in residence at VMI, e.g., an orally defended thesis for Institute Honors or the three-semester departmental honors sequence of HI 372, HI 491W, and HI 492W.

The third class English electives may be filled with any literature course offered by the Department of English, Rhetoric, and Humanistic Studies.

The third class science elective may be filled with any course offered in astronomy, biology, chemistry, computer and information sciences, geology, or physics. CE 208X may also be applied.

The minimum foreign language requirement for history majors is one foreign language through the third-year level, or two foreign languages, each through the second-year level.

The second and first class restricted elective requirements may be filled by: a) courses required for a double-major or minor in another curriculum; b) elective courses offered by the Department of Economics and Business or the Department of English, Rhetoric, and Humanistic Studies; c) courses in the International Studies Department.

Synopsis of the B.A. Curriculum in History

Fourth (Freshman) Class First Semester

Science Requirement—(BI, CH, or PY w/ lab) Credit Hours: 4
ERH 101—Writing and Rhetoric I Credit Hours: 3 *
HI 103—World History I Credit Hours: 3 *
MA 101—Math that Matters I Credit Hours: 3

ELEC Foreign Language—Foreign Language Elective Credit Hours: 3
PE 102—Boxing Credit Hours: 0.5
or
PE 105—Wellness Concepts Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 17.5

Second Semester

Science Requirement—(BI, CH, or PY w/ lab) Credit Hours: 4
ERH 102—Writing and Rhetoric II Credit Hours: 3 *
HI 104—World History II Credit Hours: 3 *
MA 102—Math that Matters II Credit Hours: 3
ELEC Foreign Language—Foreign Language Elective Credit Hours: 3
PE 102—Boxing Credit Hours: 0.5
or
PE 105—Wellness Concepts Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 17.5

Third (Sophomore) Class First Semester

EC 201—Principles of Microeconomics Credit Hours: 3
ELEC ERH—ERH Elective Credit Hours: 3 (literature)
HI 205—History of the United States I Credit Hours: 3 *
HI 200—Introduction to Historical Methods Credit Hours: 3
or
ELEC Science—Science Elective Credit Hours: 3
ELEC Foreign Language—Foreign Language Elective Credit Hours: 3
PE 101—Basic Swimming and Survival Credit Hours: 0.5
or
PE 300—Principles of Physical Conditioning Credit Hours: 1
ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 16.5-17

Second Semester

EC 202—Principles of Macroeconomics Credit Hours: 3
ELEC ERH—ERH Elective Credit Hours: 3 (literature)
ELEC Foreign Language—Foreign Language Elective Credit Hours: 3
HI 206—History of the United States II Credit Hours: 3 *
HI 200—Introduction to Historical Methods Credit Hours: 3 *
or
ELEC Science—Science Elective Credit Hours: 3
PE 101—Basic Swimming and Survival Credit Hours: 0.5
or
PE 300—Principles of Physical Conditioning Credit Hours: 1
ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 16.5-17

Second (Junior) Class First Semester

ELEC Restricted—(ERH, EC, or IS) Credit Hours: 3
ELEC Major—Major Elective Credit Hours: 3
ELEC Major—Major Elective Credit Hours: 3
PS 344—Leadership in Organizations Credit Hours: 3
ERH 103—Fundamentals of Public Speaking Credit Hours: 1
ELEC Foreign Language—Foreign Language Elective Credit Hours: 3
PE Requirement—Elective Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 18.5

Second Semester

ELEC Restricted—(ERH, EC, or IS) Credit Hours: 3
ELEC Major—Major Elective Credit Hours: 3
ELEC Major—Major Elective Credit Hours: 3
ELEC Free—Free Elective Credit Hours: 3
ELEC Foreign Language—Foreign Language Elective Credit Hours: 3
PE Requirement—Elective Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 17.5

First (Senior) Class First Semester

ELEC Restricted—(ERH, EC, or IS) Credit Hours: 3
HI 460W—Capstone Experience Credit Hours: 3
ELEC Non-HI—Non-History Elective Credit Hours: 3
ELEC Free—Free Elective Credit Hours: 3
ELEC Free—Free Elective Credit Hours: 3
PE Requirement—Elective Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 17.5

Second Semester

ELEC Restricted—(ERH, EC, or IS) Credit Hours: 3
ELEC Major—Major Elective Credit Hours: 3
ELEC Major—Major Elective Credit Hours: 3
ELEC Non-HI—Non-History Elective Credit Hours: 3
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 14
Total Hours: minimum 136
* Minimum grade of C required.

International Studies and Political Science

The Department of International Studies and Political Science offers a challenging interdisciplinary major in international studies (IS) emphasizing political science, foreign language, history, and economics. The IS curriculum is designed to educate men and women for leadership roles in the global community and provides broad training in the liberal arts with a strong emphasis on the development of communications skills, both written and oral; the ability to think analytically and critically in the field, and on providing a strong understanding of the major ethical questions central to the study of international relations/political science.

Many IS majors go on to earn graduate degrees from top institutions. IS majors are highly qualified for careers in the Armed Forces, other forms of government service, international business and industry, and for numerous other fields requiring a broad liberal arts background.

As part of their degree, IS majors are strongly encouraged to complete either a study abroad or internship experience.

Honors in International Studies and Political Science

The Department of International Studies and Political Science offers a two semester Honors program open to all qualified IS majors.

General requirements for the conferral of IS Departmental Honors: to qualify for participation in the first part of the IS Honors Sequence (i.e., for acceptance into IS 491), cadets must: have achieved a 3.5 GPA or higher in the IS major through their **sixth** academic semester at VMI; have achieved a 3.2 GPA or higher *in the overall curriculum* through their **sixth** academic semester at VMI; and complete and have approved by the head of the IS department, a formal letter of application to the IS Departmental Honors Program.

To qualify for participation in the second part of the IS Honors Sequence (i.e., for acceptance into IS 492) cadets must: have received a grade of "B" or higher in IS 491; have maintained a 3.5 GPA or higher *in the IS major* through their **seventh** academic semester at VMI; have maintained a 3.2 GPA or higher *in the overall curriculum* through their **seventh** academic semester at VMI.

To be conferred with IS Departmental Honors, cadets must: have received a grade of "B" or higher in IS 491 and IS 492; have maintained a 3.5 GPA or higher *in the IS major* through their **eighth** academic semester at VMI; have maintained a 3.2 GPA or higher *in the overall curriculum* through their **eighth** academic semester at VMI; be formally endorsed for conferral by their faculty sponsor and be on schedule to graduate at the time for the completion of the IS Honors Sequence.

Information

You can contact the Department of International Studies and Political Science at (540) 464-7676; E-mail: *Interstudies@vmi.edu*. Information, including course descriptions, cadet activities, and faculty biographies is also available at: *http://www.vmi.edu/interstudies/*

Major in International Studies and Political Science

» International Studies, B.A.

Concentrations in International Studies and Political Science

» Interdisciplinary Studies in Latin America Concentration

Minors in International Studies and Political Science

» Asian Studies Minor
» International Studies Minor
National Security Minor

International Studies, B.A.

International Studies and Political Science Curriculum Requirements

See the synopsis of the International Studies and Political Science curriculum below.

Institute Core Curriculum: Note that ERH 101 and ERH 102 must be passed with a grade of C or better. The fourth class math requirement may be filled by other math courses with the approval of the head of the International Studies and Political Science Department.

International Studies and Political Science Core Curriculum: IS majors must complete the following courses with a grade of C or better: HI 205-HI 206, IS 201, IS 210, IS 220, IS 230, IS 301, IS 310, IS 320, IS 340, IS 401W, and EC 306. One IS elective must be taken from a 400 level IS course and one from an additional IS class.

IS majors must take one ERH elective plus one elective from the following list:
ERH 207 Ethics
ERH 211 Comparative Religion
ERH 212 Ancient Greek and Medieval Philosophy
ERH 213 Modern and Contemporary Philosophy
EC 407 U.S. Economic History
EC 414 Applied Game Theory
EC 415 Political Economy of Conflict
HI 223 Islam in North America and Western Europe
HI 327 India From the Age of the Harrapans to the Present Day
HI 333 History of the Middle East I
HI 334 History of the Middle East II
HI 346 Modern Japan
HI 374 Modern Latin America
HI 375 Germany and Eastern Europe From Bismarck to Brandt
HI 382 Modern Russian History
HI 386 U.S. Military History Since 1919

The minimum foreign language requirement for majors is one foreign language through the 300 levels, or two foreign languages, each through the 200 level.

Minors in other disciplines and double majors are encouraged. Consult with the Head of the International Studies and Political Science Department.

Synopsis of the B.A. Curriculum in International Studies

Fourth (Freshman) Class First Semester

Science Requirement—(BI, CH, or PY w/ lab) Credit Hours: 4

MA 101—Math that Matters I Credit Hours: 3

ERH 101—Writing and Rhetoric I Credit Hours: 3 *
HI 103—World History I Credit Hours: 3
or
IS 201—Introduction to International Studies and Political Science Credit Hours: 3
ELEC Foreign Language—Foreign Language Elective Credit Hours: 3
PE 105—Wellness Concepts Credit Hours: 0.5
or
PE 102—Boxing Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 17.5

Second Semester

Science Requirement—(BI, CH, or PY w/ lab) Credit Hours: 4
MA 102—Math that Matters II Credit Hours: 3
ERH 102—Writing and Rhetoric II Credit Hours: 3 *
HI 104—World History II Credit Hours: 3
or
IS 201—Introduction to International Studies and Political Science Credit Hours: 3
ELEC Foreign Language—Foreign Language Elective Credit Hours: 3
PE 105—Wellness Concepts Credit Hours: 0.5
or
PE 102—Boxing Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 17.5

Third (Sophomore) Class First Semester

HI 103—World History I Credit Hours: 3
or
HI 104—World History II Credit Hours: 3
HI 205—History of the United States I Credit Hours: 3 *
EC 201—Principles of Microeconomics Credit Hours: 3
ELEC ERH—ERH Elective Credit Hours: 3
ELEC Foreign Language—Foreign Language Elective Credit Hours: 3
PE 101—Basic Swimming and Survival Credit Hours: 0.5
or
PE 300—Principles of Physical Conditioning Credit Hours: 1
ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 16.5-17

Second Semester

IS 220—International Politics Credit Hours: 3
or
IS 230—Comparative Politics Credit Hours: 3
EC 202—Principles of Macroeconomics Credit Hours: 3
HI 206—History of the United States II Credit Hours: 3 *
ELEC Foreign Language—Foreign Language Elective Credit Hours: 3
ELEC Free—Free Elective Credit Hours: 3
PE 101—Basic Swimming and Survival Credit Hours: 0.5
or
PE 300—Principles of Physical Conditioning Credit Hours: 1
ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 16.5-17

Second (Junior) Class First Semester

IS 301—Techniques of Computer Analysis Credit Hours: 3 **
EC 306—International Economics Credit Hours: 3 *
ERH 103—Fundamentals of Public Speaking Credit Hours: 1
ELEC Foreign Language—Foreign Language Elective Credit Hours: 3
PS 344—Leadership in Organizations Credit Hours: 3
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 15

Second Semester

IS 210—American Government Credit Hours: 3
IS 220—International Politics Credit Hours: 3
or
IS 230—Comparative Politics Credit Hours: 3
IS 320—National Security Policy Credit Hours: 3
ELEC Major—Major Elective Credit Hours: 3
ELEC Foreign Language—Foreign Language Elective Credit Hours: 3
PE Requirement—Elective Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 17.5

First (Senior) Class First Semester

IS 310—American Foreign Policy Credit Hours: 3
ELEC Major—Major Elective Credit Hours: 3
ELEC Major—Major Elective Credit Hours: 3
ELEC Free—Free Elective Credit Hours: 3
ELEC Free—Free Elective Credit Hours: 3
PE Requirement—Elective Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 17.5

Second Semester

IS 340—Political Theory Credit Hours: 3
IS 401W—International Studies Seminar Credit Hours: 3
ELEC Restricted—Restricted Elective Credit Hours: 3
ELEC Free—Free Elective Credit Hours: 3
ELEC Free—Free Elective Credit Hours: 3
PE Requirement—Elective Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 17.5
Total Hours: minimum 136
* Minimum Grade of "C" Required
** Open only to IS majors who have completed IS 201 with a grade of 75 or higher.
+Within the electives courses, cadets must take 6 credits within the civilization and cultures designation.

Mechanical Engineering

Mechanical engineering is the second oldest of the engineering professions and has the largest enrollment of students in the United States. Mechanical engineering is a very broad field which includes many areas of study such as refrigeration, air conditioning, energy conversion, nuclear engineering, biomedical engineering, transportation equipment engineering and industrial engineering. Mechanical engineers are employed in design, operations, sales, energy conservation, research, and management. A mechanical engineering education is an excellent background for a career in the military, government, business, or other professions such as law and medicine.

The mechanical engineering curriculum at VMI has two main branches: one branch consists of courses related to energy; the other branch has courses which are related to structures and motion in mechanical systems. The mechanical engineering program also offers two concentrations: the Aerospace Engineering Concentration and the Nuclear Engineering Concentration. The curriculum provides a broad background with courses in science, mathematics, liberal arts, and all of the engineering sciences. Extensive use is made of the computer facilities at VMI.

Mission Statement

The mission of the VMI Mechanical Engineering Department is to prepare graduates for graduate studies, a professional engineering career, or a career in the military through a continually improving curriculum of courses in engineering, related sciences, mathematics, and humanities which will ensure that our graduates are prepared to meet our educational objectives.

Educational Objectives:

The educational objectives of the VMI Mechanical Engineering Program are to produce graduates, who will, within a few years of graduation,

1. have successful careers in industry or the military, or be successfully engaged in post-graduate or advanced educational studies
2. be responsible global contributors who uphold strict ethical standards and who continue to develop their professional skills through sustained engagement in lifelong-learning activities

Goals and Supporting Student Learning Outcomes (SLO)

The potential of our graduates to realize our educational objectives depends on the skills and abilities they have developed through the ME curriculum. Therefore, the department has identified specific Educational Goals and supporting Student Learning Outcomes (SLO), related to those skills and abilities, that each cadet should possess by graduation.

Educational Goal 1

Graduates will have the ability to apply the knowledge of mathematics, science, and engineering to engineering problems in the thermal and mechanical areas.

SLO 1.1 Graduates will have the ability to apply the knowledge of mathematics (through statistics, linear algebra, multivariate calculus and differential equations), science (through chemistry and calculus-based physics), and engineering to engineering problems in the thermal and mechanical design areas.

SLO 1.2 Graduates will have the ability to analyze and design mechanical and thermal systems, components and processes.

SLO 1.3 Graduates will have the ability to design and conduct experiments, and to analyze and interpret experimental results.

SLO 1.4 Graduates will have the ability to use modern computational and analytical techniques, skills, and tools.

Educational Goal 2

Graduates will possess the professional skills and awareness necessary to responsibly practice engineering in both a technical and societal context.

SLO 2.1 Graduates will have effective oral and written communication skills.

SLO 2.2 Graduates will have the ability to effectively function on teams.

SLO 2.3 Graduates will have an understanding of their professional and ethic responsibilities.

SLO 2.4 Graduates will recognize their need of life-long learning and will possess the ability to engage in life-long learning.

Laboratory facilities consist of: Computer-aided Design and Engineering Lab; Energy Lab; Computational Labs; Instrumentation Lab; Manufacturing Lab; Materials Lab. Laboratories are designed as an extension of classroom work and provide technological experiments considered important to cadet understanding of classroom concepts. Cadets are provided practical hands-on experience on modern equipment. In addition, the department strongly emphasizes the integration of design/fabrication/testing projects, which is supported by a Cadet Projects Lab, and computational problem solution, supported by significant computational resources, across the courses taught in the ME department. Various computer programming languages are taught as well as computer-aided drafting (CAD). Both programming and CAD, as well as other computer applications, form an integral part of many of the courses taught in the department.

The Mechanical Engineering Department has been in existence since 1941 and, until 1982, served as a service department to the other engineering departments. The degree-bearing ME program, initially implemented in 1982, produced its first graduates in May 1985. The Mechanical Engineering program is accredited by the Engineering Accreditation Commission of ABET, *http://www.abet.org*.

The department sponsors a student section of the ASME (American Society of Mechanical Engineers). Participation in professional activities is emphasized with cadets being required to attend two professional society meetings as a graduation requirement. Cadets are also required to take the Fundamentals of Engineering (FE) examination as a graduation requirement during their first class year so that in the future they can become registered Professional Engineers.

Honors in Mechanical Engineering

1. Eligibility

Each candidate must:

a. A. Have an overall 3.00 quality point average in all classes (through the end of his/her 2nd class year).
b. B. Have an overall 3.25 quality point average in all Mechanical Engineering classes (through the end of his/her 2nd class year).
c. C. Have a 3.00 quality point average in all classes at graduation.
d. D. Have a 3.25 quality point average in all Mechanical Engineering classes at graduation.

2. Application and Administrative Procedures

Each candidate must:

e. A. Inform, in writing, the Department Head of their intention to participate in the Honors Program before the end of the cadet's second class year.
f. B. Register for 2 semesters of the Independent Study sequence (ME 461-ME 462).
g. C. Find a faculty adviser who is willing to supervise their Independent Study.
h. D. Have the subject of their independent study approved by the Departmental Honors Committee prior to the beginning of the Independent Study sequence. The Departmental Honors Committee will appoint a faculty Thesis Committee consisting of three faculty members including the adviser.

3. Program Requirements

Each candidate must:

i. A. Write an honors thesis. A typed draft of this thesis will be submitted to their Thesis Committee no later than five days before the beginning of the final examination period.

j. B. Present the results of their independent study to the Thesis Committee and any interested faculty no later than the second day of the final examination period, and receive the endorsement of a majority of the faculty present for the presentation.

k. C. Present the results of their independent study at an undergraduate (VMI Undergraduate Research Symposium, National Undergraduate Research Conference, MARCUS, etc.), regional, national, or international conference.

l. D. Submit the final version of their thesis to the Thesis Committee before the end of the final examination period.

Mechanical Engineering Enrollment and Graduation Data

Mechanical Engineering	**Academic Year**					
	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Undergraduate Cadets Enrolled in ME*	189	173	175	182	167	183
BS Degrees Awarded in ME**	27	29	19	28	23	38

*Fall Census

**July 1-June 30

Major in Mechanical Engineering

» Mechanical Engineering, B.S.

Concentrations in Mechanical Engineering

» Aerospace Engineering Concentration

» Nuclear Engineering Concentration

Mechanical Engineering, B.S.

Synopsis of the B.S. Curriculum in Mechanical Engineering

Fourth (Freshman) Class First Semester

ME 105—Introduction to Mechanical Engineering Credit Hours: 1
ME 109—CAD Applications and Solid Modeling Credit Hours: 1
CH 137—Introductory College Chemistry I Credit Hours: 3
CH 117—Laboratory for CH 137 Credit Hours: 1
MA 123—Calculus & Analytic Geometry I Credit Hours: 3 *
ERH 101—Writing and Rhetoric I Credit Hours: 3 *
HI 103—World History I Credit Hours: 3
PE 102—Boxing Credit Hours: 0.5
or
PE 105—Wellness Concepts Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 16.5

Second Semester

ME 110—Materials Credit Hours: 3
ME 203—Programming Tools for Mechanical Engineers Credit Hours: 2
MA 103—Matrix Algebra Credit Hours: 2
MA 124—Calculus & Analytic Geometry II Credit Hours: 3 *
ERH 102—Writing and Rhetoric II Credit Hours: 3 *
HI 104—World History II Credit Hours: 3
PE 102—Boxing Credit Hours: 0.5
or
PE 105—Wellness Concepts Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 17.5

Third (Sophomore) Class First Semester

ME 201—Statics Credit Hours: 3
PY 160—General Physics I Credit Hours: 3
PY 155—General Physics Laboratory I Credit Hours: 1
MA 215—Calculus With Analytic Geometry III Credit Hours: 4
MA 220—Probability & Statistics for Engineers & Scientists Credit Hours: 3
ERH 103—Fundamentals of Public Speaking Credit Hours: 1
PE 101—Basic Swimming and Survival Credit Hours: 0.5
or
PE 300—Principles of Physical Conditioning Credit Hours: 1
ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 16.5-17

Second Semester

ME 206—Solid Mechanics Credit Hours: 3
ME 311—Thermodynamics I Credit Hours: 3
PY 161—General Physics II Credit Hours: 3
PY 156—General Physics Laboratory II Credit Hours: 1
MA 311—Elementary Differential Equations Credit Hours: 3
EE 351—Electrical Circuits and Machines Credit Hours: 3 **
or
PS 344—Leadership in Organizations Credit Hours: 3 **

PE 101—Basic Swimming and Survival Credit Hours: 0.5
or
PE 300—Principles of Physical Conditioning Credit Hours: 1
ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 17.5-18

Second (Junior) Class First Semester

ME 302—Dynamics Credit Hours: 3
ME 313—Thermodynamics II Credit Hours: 3.5
ME 325—Instrumentation Laboratory Credit Hours: 2
EE 351—Electrical Circuits and Machines Credit Hours: 3 **
or
PS 344—Leadership in Organizations Credit Hours: 3 **
EC 322—Engineering Economy Credit Hours: 2
ELEC Free—Free Elective Credit Hours: 3
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 18.5

Second Semester

ME 314—Fluid Mechanics Credit Hours: 3.5
ME 321—Dynamics of Machinery Credit Hours: 3
ME 322—Mechanical Analysis and Design Credit Hours: 3
ME 336—Heat and Mass Transfer Credit Hours: 3.5
ME 342—Analysis and Control of Dynamic Systems Credit Hours: 3
PE Requirement—Elective Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 18.5

First (Senior) Class First Semester

ME 419—Thermal-Fluid Systems Design Credit Hours: 4
ME 425—Mechanical Design Credit Hours: 4
ME 457—Seminar Credit Hours: 0.5
ME ELEC—Technical Elective Credit Hours: 3
ME ELEC—2nd Technical Elective Credit Hours: 3
PE Requirement—Elective Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 17

Second Semester

ME 444W—Mechanical Engineering Design Credit Hours: 3
ME 458—Seminar Credit Hours: 0
ME ELEC—Technical Elective Credit Hours: 3
ELEC MA/SC—Mathematics or Science Elective Credit Hours: 3
ELEC Free—Free Elective Credit Hours: 3
ELEC Free—Free Elective Credit Hours: 3
PE Requirement—Elective Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 17.5
Total Hours: minimum 140
Electives are chosen from the distribution requirements shown below.
For all Mechanical Engineering and Technical Elective courses taken or attempted in this curriculum, a minimum 2.0 average must be maintained.
* Minimum grade of C required
** To facilitate scheduling in the department half of the cadets majoring in ME will take PS 344 and half will take EE 351.

Mechanical Engineering Curriculum Distribution Requirements for Electives

Electives are chosen by the cadet in consultation with the faculty adviser and subject to the distribution shown below.

Technical Electives

Nine (9) hours minimum course work selected from ME, CE, EE, CIS, MA, PY, CH, or BI which contribute to the quality of the cadet's program. Selection of appropriate courses must be approved by the adviser in consultation with the mechanical engineering department head.

Civilizations and Cultures Electives

Six (6) hours must be selected from the approved list of Civilizations and Cultures courses.

Elective

A three (3) credit-hour course selected from 200-level or higher. Courses in the 100-level may be selected in Modern Languages.

Math/Science Elective

A three (3) credit-hour course selected from 200 level or higher mathematics (except MA 330WXX) or an approved science course from BI, CH, or PY

Military Science (ROTC)

For further information, please see the "Reserve Officers Training Corps" section.

Modern Languages and Cultures

The Department of Modern Languages and Cultures offers an interdisciplinary major that requires in-depth study of Arabic, Chinese, French, and Spanish and emphasizes work in literatures, history, and political science. Students of Modern Languages and Cultures thus take a variety of courses aimed toward acquiring knowledge not only of a foreign language, but also of the literature, culture, history, economics, and politics of the country or area where the foreign language they are studying is the major tongue. Since the curriculum allows for 18 hours of unrestricted electives, the department encourages cadets to double major or to minor in another curriculum or to study other foreign languages (a minimum of two years study of each language). The Modern Language and Cultures Department does not accept transfer credit of internet-based or distance learning courses at any level.

The curriculum is designed to provide a student with skills to function effectively on a shrinking planet. The countries and geographical areas that combine to shape the modern world, while becoming increasingly interconnected and geographically accessible, nevertheless remain far apart in their linguistic, cultural, economic, and political systems. The Modern Languages and Cultures curriculum enhances an understanding of global issues and fosters in-depth knowledge of a country or area. Graduates of the curriculum should thus be well-prepared to pursue advanced study in a variety of fields or to find positions in teaching, the armed forces, government, the foreign service, or in multinational firms. The curriculum of Modern Languages and Cultures lays the groundwork for an individual to assume a leadership role in an increasingly internationalized world.

To earn a bachelor's degree a cadet must take all prescribed courses and acquire a minimum of 24 credit hours above the 200-level in one foreign language. A minimum of 9 credit hours must be earned in 400-level language courses. (please consult the "Synopsis of the Modern Languages and Cultures Curriculum"):

Majors must either study abroad or participate in a foreign intern program in a country where their primary foreign language is a principal tongue. Upon completion of all requirements, majors will be awarded a B.A. degree in Modern Languages and Cultures, with their language (s) specified (i.e., B.A. in Modern Languages and Cultures—French).

Honors in Modern Languages and Cultures

A cadet wishing to graduate with Honors in the Department of Modern Languages must be a Modern Language major, have a cumulative GPA of at least 3.0 in courses taken in the major (exclusive of subjects taken in the Fourth Class), and have permission of the Department Head. Cadets must complete ML 498 and ML 499 and produce a thesis which is written in the student's major foreign language, as appropriate. The thesis must achieve a language ranking of "Advanced-High" and adhere to MLA specifications.

Major in Modern Languages and Cultures

» Modern Languages and Cultures, B.A.

Minor in Modern Languages and Cultures

» Modern Languages Minor—Arabic, French, German, Spanish, Etc.

Modern Languages and Cultures, B.A.

Synopsis of the B.A. Curriculum in Modern Languages and Cultures

Fourth (Freshman) Class First Semester

ML Requirement—Foreign Language 100-level Credit Hours: 3
Science Requirement—(BI, CH, or PY w/ lab) Credit Hours: 4
MA 101—Math that Matters I Credit Hours: 3
ERH 101—Writing and Rhetoric I Credit Hours: 3 *
HI 103—World History I Credit Hours: 3
PE 102—Boxing Credit Hours: 0.5
or
PE 105—Wellness Concepts Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 17.5

Second Semester

ML Requirement—Foreign Language 100-level Credit Hours: 3
Science Requirement—(BI, CH, or PY w/ lab) Credit Hours: 4
MA 102—Math that Matters II Credit Hours: 3
ERH 102—Writing and Rhetoric II Credit Hours: 3 *
HI 104—World History II Credit Hours: 3
PE 102—Boxing Credit Hours: 0.5
or
PE 105—Wellness Concepts Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 17.5

Third (Sophomore) Class First Semester

ML Requirement—Foreign Language 200-level Credit Hours: 3
EC 201—Principles of Microeconomics Credit Hours: 3
ELEC Science—Science Elective Credit Hours: 3
ELEC ERH—ERH Elective Credit Hours: 3
ELEC Free—Free Elective Credit Hours: 3
PE 101—Basic Swimming and Survival Credit Hours: 0.5
or
PE 300—Principles of Physical Conditioning Credit Hours: 1
ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 16.5-17

Second Semester

ML Requirement—Foreign Language 200-level Credit Hours: 3
EC 202—Principles of Macroeconomics Credit Hours: 3
HI Requirement—HI 324 or HI 325 or IS 310 Credit Hours: 3
ERH 103—Fundamentals of Public Speaking Credit Hours: 1
ELEC ERH—ERH Elective Credit Hours: 3
ELEC Free—Free Elective Credit Hours: 3
PE 101—Basic Swimming and Survival Credit Hours: 0.5
or
PE 300—Principles of Physical Conditioning Credit Hours: 1
ROTC Requirement—AS, MS, or NS Credit Hours: 1

Total Semester Hrs: 17.5-18

Second (Junior) Class First Semester

ML Requirement—Foreign Language 300-level Credit Hours: 3
ML Requirement—Foreign Language 300-level Credit Hours: 3
EC 306—International Economics Credit Hours: 3
ELEC HI—History Elective Credit Hours: 3 **
PS 344—Leadership in Organizations Credit Hours: 3
PE Requirement—Elective Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 17.5

Second Semester

ML Requirement—Foreign Language 300-level Credit Hours: 3
ML Requirement—Foreign Language 300-level Credit Hours: 3
IS 220—International Politics Credit Hours: 3
ELEC HI—History Elective Credit Hours: 3 **
ELEC Free—Free Elective Credit Hours: 3
PE Requirement—Elective Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 17.5

First (Senior) Class First Semester

ML Requirement—Foreign Language 300-level Credit Hours: 3
ML Requirement—Foreign Language 400-level Credit Hours: 3
ELEC IS—International Studies Elective Credit Hours: 3 ***
ELEC Free—Free Elective Credit Hours: 3
ELEC Free—Free Elective Credit Hours: 3
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 17

Second Semester

ML Requirement—Foreign Language 400-level Credit Hours: 3
ML Capstone—Capstone Elective Credit Hours: 3
ELEC IS—International Studies Elective Credit Hours: 3
ELEC Free—Free Elective Credit Hours: 3
PE Requirement—Elective Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 14.5
Total Hours: minimum 136
* Minimum Grade of C Required
** Cadets are required to take the following history courses as appropriate to their foreign language(s): AR = HI 333 History of the Middle East I; HI 334 History of the Middle East II; CHI=Any 300-level or 400-level History course; HI 358 From Mongols to Manchus; HI 359 China in the Communist Era; FR= HI 350 France and the French Empire; HI 365 The French Revolution and Napoleon; SP= HI 373 Colonial Latin America; HI 374 Modern Latin America; HI 388 Modern Spain; Civil War-Colonial Conflict
*** Cadets are required to take an IS course appropriate to their foreign language area(s): AR = Any 300 level IS course; CHI=Any upper level IS course; FR = IS 330 Politics and Western Europe; SP = IS 335 Politics in Latin America or IS 330 Politics in Western Europe
+Cadets must take two civilizations & cultures designated courses.

Naval Science (ROTC)

For further information, please see the "Reserve Officers Training Corps" section.

Physical Education

Minor in Physical Education

» Exercise Science Minor

Physics and Astronomy

Physics is the study of the basic laws that describe all natural phenomena, and it is often instrumental to the development of new technologies. At VMI dedicated faculty mentors help cadets develop strong analytical reasoning, laboratory, computational, and technical communication skills. They also provide our majors with the opportunity to combine skills developed in their coursework with the creativity needed to solve real-world problems in independent research projects in pure and applied physics.

Mathematics is an integral part of the study of physics, and it is essential for students to come with strong mathematics skills to successfully pursue the physics major. While the physics curriculum is rich in applied mathematics, it is also a well-balanced program with many opportunities to develop hands-on laboratory and computer programming skills and to probe the relationship between experiment and mathematical theory that is the hallmark of physics.

The physics curriculum is a flexible curriculum that provides an excellent opportunity for the development of intellectual breadth while also building strong scientific and technical skills. Our degree programs offer a generous complement of electives, allowing cadets to obtain one or more minors or even to double major in select cases. This flexibility allows each cadet to point the degree along the career path that they wish to pursue. Historically, physics has been a very marketable degree that graduates use to follow a wide range of career paths in the military, industry, and in education.

Our B.S. physics degree program offers solid training for many technical career paths or for graduate study in physics and other closely allied technical fields. In addition to the core curriculum requirements, it includes 15 credit hours of free electives, 6 credit hours of humanities and social science electives, and 12 hours of technical electives.

Our B.S. in physics with a concentration in nuclear energy is specifically designed to prepare students for work in the nuclear power industry, the Navy's NUPOC program, or for graduate study in Nuclear Engineering. It includes 12 credit hours of free electives, 6 credit hours of humanities and social science electives, 6 credit hours of technical electives, and 6 credit hours of physics electives (at the 300 or 400 level).

The department houses a generous complement of well equipped classrooms, teaching laboratories and faculty research laboratories. The teaching laboratories include two general physics laboratories, an electronics and interfacing laboratory, an optics laboratory, and a modern physics laboratory. The department has a small accelerator and nuclear physics laboratory in the basement of Mallory Hall, and the VMI Observatory, a short drive from Post, has a 20-inch reflecting telescope and an array of smaller telescopes that are used in our astronomy courses and for faculty and cadet research projects.

Faculty conduct research with cadets in laboratories devoted to organic thin film device fabrication and characterization, laser physics and fiber optics, solid state and gas phase laser spectroscopy, and astronomy. Every cadet who completes the degree program will work one-on-one or in a small group with a faculty mentor on a research project.

Cadets majoring in physics and the full-time physics faculty form a close-knit academic community in which cadets can pursue a deeper understanding of the physical world while also preparing for a broad array of career paths.

Major in Physics and Astronomy

» Physics, B.S.

Minors in Physics and Astronomy

» Astronomy Minor
» Physics Minor

Physics, B.S.

Synopsis of the B.S. Curriculum in Physics

Fourth (Freshman) Class First Semester

PY 160—General Physics I Credit Hours: 3
PY 155—General Physics Laboratory I Credit Hours: 1
CH 137—Introductory College Chemistry I Credit Hours: 3
CH 117—Laboratory for CH 137 Credit Hours: 1
MA 123—Calculus & Analytic Geometry I Credit Hours: 3 *
ERH 101—Writing and Rhetoric I Credit Hours: 3 *
HI 103—World History I Credit Hours: 3
PE 102—Boxing Credit Hours: 0.5
or
PE 105—Wellness Concepts Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 18.5

Second Semester

PY 161—General Physics II Credit Hours: 3
PY 156—General Physics Laboratory II Credit Hours: 1
CH 138—Introductory College Chemistry II Credit Hours: 3
CH 118—Laboratory for CH 138 Credit Hours: 1
MA 124—Calculus & Analytic Geometry II Credit Hours: 3 *
ERH 102—Writing and Rhetoric II Credit Hours: 3 *
HI 104—World History II Credit Hours: 3
PE 102—Boxing Credit Hours: 0.5
or
PE 105—Wellness Concepts Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 18.5

Third (Sophomore) Class First Semester

PY 254—Optics Credit Hours: 3
PY 253W—Optics Laboratory Credit Hours: 1
PY 262—General Physics III Credit Hours: 3
MA 103—Matrix Algebra Credit Hours: 2
MA 215—Calculus With Analytic Geometry III Credit Hours: 4
ELEC Free—Free Elective Credit Hours: 3
PE 101—Basic Swimming and Survival Credit Hours: 0.5
or
PE 300—Principles of Physical Conditioning Credit Hours: 1
ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 17.5-18

Second Semester

PY 223—Programming and Data Analysis Credit Hours: 2
PY 257—Electronics and Interfacing Credit Hours: 4
PY ELEC—Technical Elective Credit Hours: 3
MA 311—Elementary Differential Equations Credit Hours: 3
PS 344—Leadership in Organizations Credit Hours: 3
PE 101—Basic Swimming and Survival Credit Hours: 0.5
or
PE 300—Principles of Physical Conditioning Credit Hours: 1
ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 16.5-17

Second (Junior) Class First Semester

PY 335—Modern Physics I Credit Hours: 3
PY 333W—Modern Physics Laboratory Credit Hours: 1
PY 341—Electricity and Magnetism I Credit Hours: 3
MA 301—Higher Mathematics for Engineers and Scientists Credit Hours: 3
ELEC Humanities—Humanities Elective Credit Hours: 3
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 15

Second Semester

PY 336—Modern Physics II Credit Hours: 3
PY 342—Electricity and Magnetism II Credit Hours: 3
PY 441—Classical Mechanics I Credit Hours: 3
PY ELEC—Technical Elective Credit Hours: 3
ELEC Free—Free Elective Credit Hours: 3
PE Requirement—Elective Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 17.5

First (Senior) Class First Semester

PY 420—Capstone Credit Hours: 3
PY 459—Introduction to Quantum Mechanics Credit Hours: 3
PY ELEC—Technical Elective Credit Hours: 3
ELEC Humanities—Humanities Elective Credit Hours: 3
ELEC Free—Free Elective Credit Hours: 3
PE Requirement—Elective Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 17.5

Second Semester

PY 446—Thermal Physics Credit Hours: 3
PY ELEC—Technical Elective Credit Hours: 3
ERH 103—Fundamentals of Public Speaking Credit Hours: 1
ELEC Free—Free Elective Credit Hours: 3
ELEC Free—Free Elective Credit Hours: 3
PE Requirement—Elective Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 15.5
Total Hours: minimum 137
See text for a discussion of elective requirements
*Minimum grade of C required

Psychology

The Department of Psychology offers a Bachelor of Science degree in psychology, and minors in leadership studies and psychology.

Psychology is the scientific study of human behavior and the mental, emotional, and physical processes associated with behavior. It is a science, an academic discipline, and a profession. As scientists, psychologists are concerned with the careful and systematic observation of behavior, as well as the collection, analysis, and interpretation of empirical data. As academicians, psychologists deal with theoretical concepts and interpretations, and ethical controversies. As professionals, psychologists are dedicated to improving the quality of life, enhancing personal and organizational effectiveness, and preserving the dignity of their fellow humans.

Students drawn to psychology must be willing to extend the boundaries of their knowledge about human behavior, develop mature and ethical values, learn to distinguish between valuable and trivial information, and acquire the broad perspective necessary to influence and shape the world around them. They gain from their studies a solid knowledge of psychological terms, concepts, theories, methods, and issues. They develop the ability to gather and synthesize information from a variety of sources, inside and outside the classroom, and they learn more about the human condition in the process.

Honors in Psychology

A cadet may earn honors in psychology by maintaining an overall GPA of 3.0 in all classes and a GPA of 3.25 in all psychology courses, both upon admittance to the program and at graduation. Consult with the head of the Department of Psychology for specific requirements regarding eligibility and application and administrative procedures.

Major in Psychology

» Psychology, B.S.

Minors in Psychology

» Leadership Studies Minor
» Psychology Minor

Psychology, B.S.

Psychology Curricula Requirements

The psychology curriculum for the Bachelor of Science degree requires 136 hours to graduate, of which 45 must be in psychology. (Note: PS 201, ERH 101, and ERH 102 must be passed with a grade of C or better.)

Synopsis of the B.S. Curriculum in Psychology

Fourth (Freshman) Class First Semester

BI 101—General Biology I Credit Hours: 4
ERH 101—Writing and Rhetoric I Credit Hours: 3 *
MA 101—Math that Matters I Credit Hours: 3
HI 103—World History I Credit Hours: 3
PE 102—Boxing Credit Hours: 0.5
or
PE 105—Wellness Concepts Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 14.5

Second Semester

PS 201—Introduction to Psychology Credit Hours: 3
BI 102—General Biology II Credit Hours: 4
ERH 102—Writing and Rhetoric II Credit Hours: 3 *
MA 102—Math that Matters II Credit Hours: 3
HI 104—World History II Credit Hours: 3
PE 102—Boxing Credit Hours: 0.5
or
PE 105—Wellness Concepts Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 17.5

Third (Sophomore) Class First Semester

PS 202—Introduction to Research Methods Credit Hours: 3
PS Core—PS Core C Credit Hours: 3
CH 131—Chemical Science I Credit Hours: 3
CH 111—Laboratory for CH 131 Credit Hours: 1
ELEC ERH—ERH Elective Credit Hours: 3 ***
ELEC Free—Free Elective Credit Hours: 3
PE 101—Basic Swimming and Survival Credit Hours: 0.5
or
PE 300—Principles of Physical Conditioning Credit Hours: 1
ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 17.5-18

Second Semester

PS 205—Statistics for the Behavioral Sciences Credit Hours: 3
PS 344—Leadership in Organizations Credit Hours: 3
PS Core—PS Core C Credit Hours: 3
CH 132—Chemical Science II Credit Hours: 3
CH 112—Laboratory for CH 132 Credit Hours: 1
ELEC ERH—ERH Elective Credit Hours: 3 ***
PE 101—Basic Swimming and Survival Credit Hours: 0.5
or
PE 300—Principles of Physical Conditioning Credit Hours: 1
ROTC Requirement—AS, MS, or NS Credit Hours: 1
Total Semester Hrs: 17.5-18

Second (Junior) Class First Semester

PS Core—PS Core A Credit Hours: 3
PS Core—PS Core B Credit Hours: 3
PS Core—PS Core D Credit Hours: 3
PS LAB—PS Lab Credit Hours: 1
ELEC Science—Science Elective Credit Hours: 3 **
ELEC Free—Free Elective Credit Hours: 3
PE Requirement—Elective Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 18.5

Second Semester

PS Core—PS Core A Credit Hours: 3
PS Core—PS Core B Credit Hours: 3
PS LAB—PS Lab Credit Hours: 1
ERH 103—Fundamentals of Public Speaking Credit Hours: 1
ELEC Science—Science Elective Credit Hours: 3 **
ELEC Free—Free Elective Credit Hours: 3
PE Requirement—Elective Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 16.5

First (Senior) Class First Semester

PS 402W—Advanced Research Methods (formerly Research Methods in Psychology) Credit Hours: 3
PS Core—PS Core D Credit Hours: 3
ELEC Free—Free Elective Credit Hours: 3
ELEC Free—Free Elective Credit Hours: 3
ELEC Free—Free Elective Credit Hours: 3
PE Requirement—Elective Credit Hours: 0.5
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 17.5

Second Semester

PS 403W—Independent Project Credit Hours: 3
PS Core—PS Core D Credit Hours: 3
PS LAB—PS Lab Credit Hours: 1
ELEC Free—Free Elective Credit Hours: 3
ELEC Free—Free Elective Credit Hours: 4
ROTC Requirement—AS, MS, or NS Credit Hours: 2
Total Semester Hrs: 16
Total Hours: minimum 136
* Minimum Grade of C required.
** Must be taken from: AT, BI, CH, CIS, MA, PY, or PS courses not otherwise applied.
*** ERH electives include ERH 207, ERH 212, ERH 213, ERH 323, and ERH 332.

Psychology Core Groups:

a. PS 301 Learning, PS 401 Cognition, PS 404 History and Systems
b. PS 302 Social, PS 305 Abnormal, PS 315 Personality
c. PS 309 Fundamentals of Biopsychology, PS 314 Physiology and Behavior, PS 307 Developmental
d. Any other three PS courses, including those listed in Cores A, B, or C.

Academic Concentrations

Departments, with the approval of the Academic Board, may offer a minor (a secondary field of study outside the major) and/or concentration (an emphasis within the major). A minimum of 15 semester hours is required in the minor or concentration field and any additional requirements established by the department. The cadet must maintain at least a 2.0 GPA in the course work for the minor or concentration.

Aerospace Engineering Concentration

A cadet may elect to obtain a concentration in Aerospace Engineering. To obtain a concentration in Aerospace Engineering a cadet must complete ME 311, ME 314, and 3 of the following 6 courses, ME 413, ME 415, ME 416, ME 417, ME 481, ME 484 for a total of 15 hours. A 2.0 GPA must be maintained in courses for the concentration. A cadet must obtain permission from both the ME department head and the head of the cadet's major field of study.

Must Complete

ME 311—Thermodynamics I Credit Hours: 3
ME 314—Fluid Mechanics Credit Hours: 3.5

Also Must Complete 3 of the Following 6 Courses

ME 413—Aircraft Propulsion Systems Credit Hours: 3
ME 415—Flight Mechanics Credit Hours: 3
ME 416—Fundamentals of Aerodynamics Credit Hours: 3
ME 417—Aircraft Structural Analysis Credit Hours: 3
ME 481—Computational Modeling and Virtual Design Credit Hours: 3 (Aerospace Project)
ME 484—Fiber Reinforced Composite Materials Credit Hours: 3 (Aerospace Project)

Art History and Visual Culture Concentration

The Art History and Visual Culture Concentration prepares cadets for a world where the proliferation of images—in new media as well as in traditional forms—demands a critical engagement with the visual environment. Cadets following this track will improve their visual literacy through courses that stress close looking and critical thinking. Each of the classes in the minor highlights the importance of dynamic communication, asking Cadets to prepare multimedia presentations and produce analytical writing. In addition to helping them develop such important skills, the focus on art objects, artists, and theoretical perspectives provides Cadets with robust exposure to art's traditional role as a force and shapes and reflects broad cultural phenomena.

Required:

ERH 215—History of Art I Credit Hours: 3
or
ERH 216—History of Art II Credit Hours: 3
Five courses, at least one which is at the 300- or 400-level:
ERH 204—The Language of Art Credit Hours: 3
ERH 215—History of Art I Credit Hours: 3
ERH 216—History of Art II Credit Hours: 3
ERH 217—Film and Performance Studies Credit Hours: 3
ERH 221—Digital Rhetorics Credit Hours: 3
ERH 225—Visual Arts Studio Credit Hours: 3
ERH 230—Artistic Responses to Social and Political Issues Credit Hours: 3
ERH 331—Aesthetics Credit Hours: 3
ERH 341—Contemporary Art Since 1945 Credit Hours: 3
ERH 370-379—Studies in Art and Culture Credit Hours: 3

Note:

When appropriate, other courses may be substituted, e.g., ERH 230—Artistic Responses to Social and Political Issues, ERH 421—One Text, and ERH 422—Major Figures. A notation will be included on the course schedule so that cadets are aware of this possibility.

Biochemistry and Molecular Biology (BMB) Concentration

The Concentration in Biochemistry and Molecular Biology is a collaborative effort between the biology and chemistry departments and is designed for the biology, chemistry, or other science or engineering majors who wish to emphasize biochemical or molecular issues in their studies. It is also designed to offer students undergraduate research opportunities in these areas. This option does not change the credit hours needed for the B.S./B.A. in biology or the B.S./B.A. in chemistry degrees.

The Concentration requires completion of BI 101—General Biology I or BI 113—Fundamentals of Biology III, BI 205—Genetics or BI 346—Genetics, CH 322—Metabolic Biochemistry, and CH 323—Laboratory for CH 321. Students must also choose one from each of the following categories: Cell Elective: either BI 404—Cell Biology or BI 313—Microbiology; Molecular Elective: either BI 430—Molecular Biology or CH 301—Physical Chemistry I; and Biochemistry Elective: either CH 321—Structural Biochemistry or BI 325—Ecological Biochemistry. Students must also complete 4 credits minimum of research experience in an approved area of biology or chemistry. The research experience may be obtained through thesis research, independent research, summer research, a combination of these experiences, or an approved external research experience that offers academic credit. A 2.0 GPA must be maintained in BMB courses for the concentration. An application form for the BMB concentration can be obtained from the biology department secretary or BMB Director.

Required Courses

BI 101—General Biology I Credit Hours: 4
or
BI 113—Fundamentals of Biology III Credit Hours: 4
BI 346—Genetics Credit Hours: 4
CH 322—Metabolic Biochemistry Credit Hours: 3
CH 323—Laboratory for CH 321 Credit Hours: 1.5

Cell Elective (choose one of these)

BI 313—Microbiology Credit Hours: 4
or
BI 404—Cell Biology Credit Hours: 3

Molecular Elective (choose one of these)

CH 301—Physical Chemistry I Credit Hours: 3
or
BI 430—Molecular Biology Credit Hours: 3

Biochemistry Elective (choose one of these)

CH 321—Structural Biochemistry Credit Hours: 3

or

BI 325—Ecological Biochemistry Credit Hours: 4

Ecology, Conservation, and Organismal Sciences (ECOS) Concentration

The Concentration in Ecology, Conservation, and Organismal Sciences (ECOS) is intended for cadets who wish to explore field-based and organismal disciplines of biology, including plant and animal biology, conservation, and ecology. The program also is intended to promote hands-on experiences through undergraduate research, internships in related fields, or immersion in a designated intensive field-oriented class. The ECOS option does not affect the credit hours required for the B.S. or B.A. in biology, however, 14 credit hours must be obtained from the following list of courses: BI 216 Animal Behavior, BI 217 General Botany, BI 219 Conservation Biology, BI 304 Comparative Vertebrate Morphology, BI 307 Vertebrate Biology, BI 312 Ecology, BI 321 Invertebrate Zoology, BI 324 Ornithology, BI 326 Parasitology, or BI 310 Evolutionary Biology. Of these 14 required credits, cadets must take at least one taxon specific course (BI 216, BI 217, BI 304, BI 321, BI 324 or BI 326), and one concept-based course (BI 219, BI 310, BI 312, or BI 325). Cadets must complete an additional 4 credit hours by fulfilling an Intensive Experience, which may include an approved ECOS research project or internship, or a course that has been designated as "field intensive". Approved research projects may include 2 semesters of independent research (BI 390/390W/BI 391/391W or BI 490/490W/BI 491/491W), a Summer Undergraduate Research Initiative (SURI) project, or an equivalent project that has been arranged with approval of a faculty mentor and the ECOS Director. Fulfilling the department's capstone experience requirement may also satisfy this Intensive Experience need. Conducting a summer internship through an approved partner organization is a viable alternative to research, and in fact may be preferable for cadets with particular career goals. Fulfillment of the Intensive Experience also may be accomplished by completing a course that has been designated as "field intensive" by the ECOS Director (BI 351/BI 352 or equivalent). A 2.0 GPA must be maintained in ECOS courses for the concentration. Permission to participate in the program must be obtained from the student's department head and the ECOS Director. An application form for the ECOS concentration can be obtained from the Biology Department Secretary or on-line through the ECOS website.

Suggested Course Selection for the ECOS Concentration

Must select 14 credit hours from the following two lists of courses.

Taxon Specific Courses

Of the 14 credits, at least one course must be from the following:

BI 216—Animal Behavior Credit Hours: 3
BI 217—General Botany Credit Hours: 4
BI 219—Conservation Biology Credit Hours: 4
BI 304—Comparative Vertebrate Morphology Credit Hours: 4
BI 307—Vertebrate Biology Credit Hours: 4
BI 321—Invertebrate Zoology Credit Hours: 4
BI 324—Ornithology Credit Hours: 4
BI 326—Parasitology Credit Hours: 4

Concept-Based Courses

Of the 14 credits, at least one course must be from the following:

BI 310—Evolutionary Biology Credit Hours: 3
BI 312—Ecology Credit Hours: 4
BI 325—Ecological Biochemistry Credit Hours: 4

Financial Management Concentration

The Concentration in Financial Management is designed for the Economics and Business majors who wish to emphasize financial issues in their studies. It is also designed to facilitate the transition to graduate-level work in accounting and finance. This option does not change the 139 credit hours necessary for the degree. Economics and Business majors who wish to declare a Financial Management Concentration must apply in person to the head of the Department of Economics and Business.

All course work for the Concentration in Financial Management must be completed with an overall 2.0 average.

In addition to meeting the requirements of the major in Economics and Business, the following courses are required for the Concentration in Financial Management:

Required Economics and Business Electives Courses:

BU 310—Business Finance Credit Hours: 3
BU 411W—Equity Markets and Investing Credit Hours: 3
BU 412—Fixed Income, Derivatives, and Alternative Assets Credit Hours: 3
EC 430—Financial Modeling Credit Hours: 3

Plus one of the following Economics and Business Electives:

BU 305—Intermediate Accounting Credit Hours: 3
BU 415—Financial Statements Analysis Credit Hours: 3
EC 307—International Finance Credit Hours: 3
EC 405—Money and Banking Credit Hours: 3

Global Management Concentration

The Concentration in Global Management is designed for Economics and Business majors who wish to emphasize international issues and globalization in their studies. This option does not change the 139 credit hours necessary for the degree. Economics and Business majors who wish to declare a Global Management Concentration must apply in person to the head of the Department of Economics and Business.

Complete five of the following ECBU courses

In order to complete this concentration, cadets will be required to complete five of the following ECBU courses:

BU 220—Principles of Management Credit Hours: 3
BU 306—International Business Credit Hours: 3
BU 419—International Marketing Credit Hours: 3
EC 307—International Finance Credit Hours: 3
EC 308—International Trade Credit Hours: 3
EC 401—Developmental Economics Credit Hours: 3
EC 435WX—Institutions and Economic Development Credit Hours: 3

Elective substitutions

One of the following electives may be substituted for one of the ECBU courses listed above (with approval of the Department Head).

IS 220—International Politics Credit Hours: 3
IS 230—Comparative Politics Credit Hours: 3
IS 310—American Foreign Policy Credit Hours: 3
IS 435WX—Comparative Political Economy Credit Hours: 3
IS 352—International Law Credit Hours: 3

Study Abroad

All coursework for the concentration in global management must be completed with an overall 2.0 average.

Interdisciplinary Studies in Latin America Concentration

Cadets interested in this concentration area should consult with COL Dennis M. Foster, Department Head of International Studies to determine program requirements.

Literary Studies Concentration

Cadets who pursue the Literary Studies Concentration will analyze significant works of literature in the context of the traditions and cultures that shaped and were shaped by them. Cadets will utilize various critical approaches to evaluate, understand, and respond to works from a variety of genres and historical periods in order to appreciate the important role of literature in reflecting and shaping one's values, beliefs, and practices. In addition to studying the works of established writers, Cadets will compose their own creative works.

Required:

ERH 205—British Literary Traditions Credit Hours: 3
ERH 206—American Literary Traditions Credit Hours: 3
Four courses, at least one which is at the 300- or 400-level:
ERH 203—Ways of Reading Credit Hours: 3
ERH 222—Genre Studies—Poetry Credit Hours: 3
ERH 223—Genre Studies—Fiction Credit Hours: 3
ERH 224—Genre Studies—Nonfiction Credit Hours: 3
ERH 304—Language and Style Credit Hours: 3
ERH 321—British Literature in Cultural Context Credit Hours: 3
ERH 322—American Literature in Cultural Context Credit Hours: 3
ERH 323—Philosophy and Literature Credit Hours: 3
ERH 331—Aesthetics Credit Hours: 3

Note:

When appropriate, other courses may be substituted, e.g., ERH 230—Artistic Responses to Social and Political Issues, ERH 421—One Text, and ERH 422—Major Figures. A notation will be included on the course schedule so that cadets are aware of this possibility.

Military History Concentration

This concentration or minor can be declared through the Department of: History

This option is available to history majors as a concentration in military history. They must complete twelve hours of military history electives. Cadets must also meet all other requirements such as regional distributions.

A minor in Military History is available to cadets majoring in other curricula. The requirement for the military history minor are HI 103, HI 104, HI 205 or 205W, HI 206 all with a grade of C or better, and twelve additional hours of military history electives to total twenty four hours of history.

Nuclear Engineering Concentration

A cadet may elect to obtain a concentration/minor in Nuclear Engineering. To obtain a concentration/minor in Nuclear Engineering a cadet must complete the mandatory courses and two of the three available electives for a total of 15 hours. A 2.5 GPA must be maintained in the courses for the concentration/minor. A cadet must obtain permission from both the ME Department head and the head of the cadet's major field of study.

Mandatory

ME 311—Thermodynamics I Credit Hours: 3
ME 313—Thermodynamics II Credit Hours: 3.5
ME 314—Fluid Mechanics Credit Hours: 3.5 or
CE 309—Fluid Mechanics Credit Hours: 3

Elective Courses (choose two out of three).

ME 431—Power Plant Design Credit Hours: 3
PY 344—Nuclear Physics Credit Hours: 3
PY 453—Nuclear Reactor Engineering Credit Hours: 3

Philosophy Concentration

This Concentration in Philosophy will develop cadets' skills in analytical reasoning, critical thinking, argumentation, and textual analysis. Application of these skills is essential for the citizen-soldier, for each sharpens the cadet's ability to evaluate and reason, learn from others, and communicate. Cadets will explore the works of great philosophers from Plato and Aristotle to Nietzsche and Wittgenstein, and review questions in ethics, metaphysics, epistemology, and the philosophy of mind. Cadets will practice formulating arguments in written works and test their ability to analyze and synthesize knowledge in oral discussions.

Two of the following are required:

ERH 207—Ethics Credit Hours: 3
ERH 212—Ancient Greek and Medieval Philosophy Credit Hours: 3
ERH 213—Modern and Contemporary Philosophy Credit Hours: 3
Four courses, at least one which is at the 300- or 400-level:
ERH 207—Ethics Credit Hours: 3
ERH 212—Ancient Greek and Medieval Philosophy Credit Hours: 3
ERH 213—Modern and Contemporary Philosophy Credit Hours: 3
ERH 201—Rhetorical Traditions I Credit Hours: 3
or
ERH 202—Rhetorical Traditions II Credit Hours: 3
ERH 240—Poverty and Human Capability Credit Hours: 3
ERH 323—Philosophy and Literature Credit Hours: 3
ERH 331—Aesthetics Credit Hours: 3
ERH 332—Logic and Critical Thinking Credit Hours: 3

Note:

When appropriate, other courses may be substituted, e.g., ERH 421—One Text and ERH 422—Major Figures. A notation will be included on the course schedule so that cadets are aware of this possibility.

Rhetoric and Writing Concentration

Cadets who concentrate in Rhetoric and Writing will examine the philosophical and ethical foundations of rhetoric while developing and practicing the skills necessary for effective communication in public, professional, and private spheres. They learn to analyze rhetorically complex acts of communication (texts, speeches, images, gestures) by taking into consideration socio-political, historical, and cultural contexts in order to better understand human motives and enhance cooperation through the effective use of language

Required:

ERH 201—Rhetorical Traditions I Credit Hours: 3
ERH 202—Rhetorical Traditions II Credit Hours: 3
Four courses, at least one which is at the 300- or 400-level:
ERH 207—Ethics Credit Hours: 3
ERH 212—Ancient Greek and Medieval Philosophy Credit Hours: 3
ERH 221—Digital Rhetorics Credit Hours: 3
ERH 222—Genre Studies—Poetry Credit Hours: 3
ERH 223—Genre Studies—Fiction Credit Hours: 3
ERH 224—Genre Studies—Nonfiction Credit Hours: 3
ERH 230—Artistic Responses to Social and Political Issues Credit Hours: 3
ERH 250—Teaching Writing Credit Hours: 3
ERH 301—Rhetoric and Public Address Credit Hours: 3
ERH 302—Civic Discourse Credit Hours: 3
ERH 303—Cultural Rhetorics Credit Hours: 3
ERH 304—Language and Style Credit Hours: 3
ERH 311-313—Professional Writing (Discipline/Field Specific) Credit Hours: 3
ERH 314—Technical Communication Credit Hours: 3
ERH 411—Fieldwork Credit Hours: 3
ERH 470-479—Seminar in Rhetoric and Writing Credit Hours: 3

Note:

When appropriate, other courses may be substituted, e.g., ERH 421—One Text, ERH 422—Major Figures, and ERH 495-496 Honors Thesis I & II. A notation will be included on the course schedule so that cadets are aware of this possibility. In addition, one Writing Intensive (W) course may be substituted for one Rhetoric/Writing elective.

Academic Minors

Departments, with the approval of the Academic Board, may offer a minor (a secondary field of study outside the major) and/or concentration (an emphasis within the major). A minimum of 15 semester hours is required in the minor or concentration field and any additional requirements established by the department. The cadet must maintain at least a 2.0 GPA in the course work for the minor or concentration.

Art History and Visual Culture Minor

This minor can be declared through the department of English, Rhetoric, and Humanistic Studies.

The Art History and Visual Culture Minor prepares cadets for a world where the proliferation of images—in new media as well as in traditional forms—demands a critical engagement with the visual environment. Cadets following this track will improve their visual literacy through courses that stress close looking and critical thinking. Each of the classes in the minor highlights the importance of dynamic communication, asking Cadets to prepare multimedia presentations and produce analytical writing. In addition to helping them develop such important skills, the focus on art objects, artists, and theoretical perspectives provides Cadets with robust exposure to art's traditional role as a force that shapes and reflects broad cultural phenomena.

Required:

ERH 215—History of Art I Credit Hours: 3
or
ERH 216—History of Art II Credit Hours: 3
Five courses, at least one of which is at the 300- or 400-level:
ERH 204—The Language of Art Credit Hours: 3
ERH 215—History of Art I Credit Hours: 3
ERH 216—History of Art II Credit Hours: 3
ERH 217—Film and Performance Studies Credit Hours: 3
ERH 221—Digital Rhetorics Credit Hours: 3
ERH 225—Visual Arts Studio Credit Hours: 3
ERH 230—Artistic Responses to Social and Political Issues Credit Hours: 3
ERH 331—Aesthetics Credit Hours: 3
ERH 341—Contemporary Art Since 1945 Credit Hours: 3
ERH 370-379—Studies in Art and Culture Credit Hours: 3

Note:

When appropriate, other courses may be substituted, e.g., ERH 230—Artistic Responses to Social and Political Issues, ERH 421—One Text, and ERH 422—Major Figures. A notation will be included on the course schedule so that cadets are aware of this possibility.

Asian Studies Minor

This interdisciplinary minor can be declared through the Department of International Studies and Political Science.

The purpose of the Asian Studies Minor is to support the study of Asia on Post and develop "citizens of character who anticipate, respond, and lead in a complex and changing world." This academic experience is designed to rigorously educate cadets on the affairs of East, Central, South, and Southeast Asia. Cadets can design their program of study to focus on a particular country, such as China, or enroll in courses that cover a variety of topics in order gain a rich understanding of the region.

In the recent past, a number of departments have offered classes that can fulfill the requirements of the Asian Studies minor, including International Studies, History, Modern Language and Cultures, and Economics and Business. Cadets who pursue majors in these departments are especially encouraged to consider this opportunity. For information about courses and plans of study, please see LTC Howard Sanborn.

Asian Studies Minor Requirements

Cadets will take eighteen credits of electives, with at least three credits from each of three departments. Substitutions to the elective curriculum will be considered by the affiliated faculty.

International Studies and Poliictical Science

(choose at least 3 credits)
IS 332X—Politics in East Asia Credit Hours: 3
IS 333—Politics in Southeast Asia Credit Hours: 3

IS 334X—Politics of Central Asia Credit Hours: 3
IS 336WX—Politics in China Credit Hours: 3
IS 338—Politics of India and the Subcontinent Credit Hours: 3

History (choose at least 3 credits)

HI 310X—War and Society in Modern China Credit Hours: 3
HI 327—India From the Age of the Harrapans to the Present Day Credit Hours: 3
HI 346—Modern Japan Credit Hours: 3
HI 358—From Mongols to Manchus: Chinese Imperial History, 1206-1911 Credit Hours: 3
HI 359—China in the Communist Era (1949-Present) Credit Hours: 3

Modern Languages and Cultures

(choose at least 3 credits)
200, 300, 400-level Chinese language
CHI 210—Chinese Martial Arts Cinema Credit Hours: 3
CHI 481—Survey of Chinese Culture and Society Credit Hours: 3
* 100-level Chinese language courses will not count toward the minor

Astronomy Minor

This minor can be declared through the Department of Physics and Astronomy.

A minor in astronomy is offered to cadets who desire to complement their major area of study with additional work in the field of astronomy. The student must complete the following courses:

Minor Requirements:

PY 160—General Physics I Credit Hours: 3
PY 161—General Physics II Credit Hours: 3 and
PY 155—General Physics Laboratory I Credit Hours: 1
PY 156—General Physics Laboratory II Credit Hours: 1
AT 201—Introductory Astronomy I Credit Hours: 3
AT 202—Introductory Astronomy II Credit Hours: 3
AT 301—Observational Techniques Credit Hours: 4
AT 306—Introductory Astrophysics Credit Hours: 3

Note:

A minimum GPA of 2.0 is required in all courses required for the minor.

Business Minor

This minor can be declared through the Department of Economics and Business.

The Department of Economics and Business offers a minor in business. The business minor is intended for those cadets in other curricula who wish to supplement their major with a general business orientation.

The discipline of business is concerned with decision making based upon consideration of costs and benefits. Such decision making is central to the conduct of both private enterprises and the public sector of our society. Cadets are required to complete EC 201 or EC 202, EC 303*, BU 210, BU 220, BU 230, BU 310 , plus one additional course which may include the second of the EC 201-202 sequence or BU 211, BU 316, BU 330, BU 339.

To pursue a minor in business, cadets must obtain the permission of the Head of the Department of Economics and Business and the head of the department of their major field. The necessary application form can be obtained from the Head of the Department of Economics and Business. Cadets must maintain an overall 2.0 in the minor and complete all required course work with a grade of "C" or higher. All required courses must be taken at VMI. In addition, no more than one elective courses can be taken at another school.

*Competency in statistics can be demonstrated by receiving a "C" or higher in MA 101 and MA 102 or MA 220 or MA 326 in lieu of EC 303.

Chemistry Minor

This minor can be declared through the Department of Chemistry.

The Department of Chemistry offers a minor in chemistry to those cadets wishing to expand their scientific knowledge beyond their declared major. A cadet wishing to obtain a minor in Chemistry must submit a plan of study to the Department Head in Chemistry for approval. The plan of study must include no less than 21.5 credit hours of chemistry courses selected from the courses listed below. As part of the 21.5 credit hour requirement for the minor, a student must first complete the three courses listed below as "Non-Elective Requirements." To insure a breadth of coverage in the field of chemistry, a minimum of three courses listed below as "Group I Electives" must be chosen, and each selected course must be in a different area of chemistry; biochemistry, organic, physical, inorganic, or analytical. Finally, at least one laboratory course listed below as "Group II Electives" must be completed.

The plan of study should include all college level courses completed by the cadet as well as all courses the cadet intends to complete prior to graduation. All changes to the plan of study must be approved by the Depattment Head in order to maintain eligibility for the chemistry minor.

Non-Elective Requirements:

(You must complete all of these)
CH 131—Chemical Science I Credit Hours: 3
and CH 111—Laboratory for CH 131 Credit Hours: 1
or
CH 137—Introductory College Chemistry I Credit Hours: 3
and CH 117—Laboratory for CH 137 Credit Hours: 1
And also
CH 132—Chemical Science II Credit Hours: 3
and CH 112—Laboratory for CH 132 Credit Hours: 1
or
CH 138—Introductory College Chemistry II Credit Hours: 3
and CH 118—Laboratory for CH 138 Credit Hours: 1
Plus
CH 223—Organic Chemistry I Credit Hours: 3

Group I Electives:

(Pick at least three)
CH 224—Organic Chemistry II Credit Hours: 3 (Chemistry Area—Organic)
CH 246—Inorganic Chemistry Credit Hours: 3 (Chemistry Area—Inorganic)
CH 301—Physical Chemistry I Credit Hours: 3 (Chemistry Area—Physical)
or CH 467—Theoretical Chemistry Credit Hours: 3 (Chemistry Area—Physical)
CH 321—Structural Biochemistry Credit Hours: 3 (Chemistry Area—Biochemistry)
or CH 322—Metabolic Biochemistry Credit Hours: 3 (Chemistry Area—Biochemistry)
CH 335—Analytical Chemistry I Credit Hours: 3 (Chemistry Area—Analytical)
or CH 336—Analytical Chemistry II Credit Hours: 3 (Chemistry Area—Analytical)

Group II Electives:

(Pick at least one)
CH 225—Organic Laboratory I Credit Hours: 3
CH 226—Organic Laboratory II Credit Hours: 3
CH 229—Organic Laboratory I for Non-Majors Credit Hours: 1.5
CH 230—Organic Laboratory II for Non-Majors Credit Hours: 1.5
CH 311W—Laboratory for CH 301 Credit Hours: 3
CH 312W—Laboratory for CH 302 Credit Hours: 3
CH 323—Laboratory for CH 321 Credit Hours: 1.5
CH 337—Laboratory for CH 335 Credit Hours: 3

CH 338—Laboratory for CH 336 Credit Hours: 3

CH 434—Chemical Synthesis Credit Hours: 3

Computer and Information Sciences Minor

This minor can be declared through the Department of Computer and Information Sciences.

The minor is intended for those cadets in other curricula who wish to supplement their major with a foundation and application in computer and information sciences.

Minor requirements—18 Credit Hours as shown below.

Minor Required Courses: 9 Credit Hours

CIS 101—Introduction to Computer Science or a CIS course 200 level or above (3 Credits)

and one sequence chosen from:

CIS 111—Programming I and CIS 112—Programming II

or

EE 240—C Programming and EE 242—C++ and Object Oriented Programming (6 Credits total)

Minor Electives: 9 Credit Hours

Nine Credit Hours chosen from CIS courses numbered 300 or above.

Cadets must maintain an overall 2.0 in the minor and complete all required course work with a grade of "C" or higher.

Computer Engineering Minor

This minor can be declared through the department of Electrical and Computer Engineering.

Minor Requirements—18-20 Credit Hours

EE 129—Introduction to Digital Logic Circuits Credit Hours: 3

EE 228—Digital Systems Design Credit Hours: 3

ECE ELEC—Electrical & Computer Engineering Elective Credit Hours: 3 *

ECE ELEC—Electrical & Computer Engineering Elective Credit Hours: 3 *

* Requires ECE Departmental Approval

And, one of the two options below:

Option 1: (C/C++sequence) 6 Credit Hours

EE 140—C Programming Credit Hours: 3

EE 142—C++ & Object Oriented Programming Credit Hours: 3

Option 2: (Java sequence) 8 Credit Hours

CIS 111—Programming I Credit Hours: 3

CIS 111L—Laboratory for Programming I Credit Hours: 1

CIS 112—Programming II Credit Hours: 3

CIS 112L—Laboratory for Programming II Credit Hours: 1

Cybersecurity Minor

This minor can be declared through the Department of Computer and Information Sciences.

Director: COL Mohamed Eltoweissy (X7939, *eltoweissymy@vmi.edu*)

Eligibility

Cadets in ALL VMI academic departments

Admission Requirements

The Minor in Cybersecurity requires a 3.0 GPA for admission.

Good Standing Requirement

Cadets must maintain a 3.0 GPA in the minor program throughout their course of study.

Student Learning Outcomes

1. Demonstrate understanding of cyber security, ethics and resilience concepts as transdisciplinary, with an understanding of major technical, management, legal, regulatory, and compliance frameworks
2. Describe major components of primary cyber security and cyber resilience systems/components for the prevention, detection, response and resilience to cyber attacks
3. Describe ethical components of decision-making in cyber and cyber security practices and applications
4. Analyze cyber-enabled systems as pertaining to vulnerabilities, threats, risks and resilience
5. Analyze behaviors in cyberspace, and identify potential ethical conflicts and means for their resolution
6. Develop an artifact assimilating knowledge of technical, management and behavioral aspects in securing cyber-enabled systems

   Demonstrate good written and oral technical communication skills

Course Requirements

21 Credits total plus practicum

9 core credits [No prerequisite courses (beyond the VMI core) are required for any of the core courses]

Cyber Systems, Security, and Resilience

Programming

CIS 111—Programming I Credit Hours: 3

or

CIS 310—Computational Thinking and Programming Credit Hours: 3

or

Behavior and Ethics

ERH 207—Ethics Credit Hours: 3

or

PS 201—Introduction to Psychology Credit Hours: 3

» 12 elective credits chosen from among two of the following tracks (the reason for restricting the electives to two tracks is to provide adequate depth):

Technical Track

CIS 112—Programming II Credit Hours: 3 or

EE 445—Computer Networks Credit Hours: 3

EE 328—Computer Architecture Credit Hours: 3

Management and Policy Track

BU 330—Management Information Systems Credit Hours: 3

BU 335—Web 2.0 for Business Credit Hours: 3

EC 414—Applied Game Theory Credit Hours: 3

IS 320—National Security Policy Credit Hours: 3

Humanistic and Social Studies Track

ERH 221—Digital Rhetorics Credit Hours: 3

ERH 302—Civic Discourse Credit Hours: 3

ERH 314—Technical Communication Credit Hours: 3

ERH 332—Logic and Critical Thinking Credit Hours: 3

PS 302—Social Psychology Credit Hours: 3
PS 313—Forensic Psychology Credit Hours: 3
Critical Infrastructure Track
**Under Development*
» No more than three elective courses in any one track
» At least 15 credits outside the major
Practicum
» Must be pre-approved by the minor coordinator
» Must address issues related to security, ethics and resilience
» Requires a final report and presentation
» May include, but not limited to, any of the following:
  › Capstone project
  › Internship
  › Summer research project
  › Community and/or professional service (minimum 40 hours)

Suggested Sample Projects for CySec

1. Exploting and developing solutions for critical infrastructure security
2. Nature-inspired cyber security solutions
3. Modeling and analysis of secure enterprise information systems
4. Evaluation of cryptographic algorithms
5. Designing a platform for cyber competitions
6. Privacy-preserving healthcare management systems
7. Exploration of relevant policies such as HIPPA, Sarbanes-Oxley, etc.
8. Design and analysis of attacker-defender games
9. Cloud computing platforms for cyber resilience
10. Exploring the tension between security and privacy

Economics Minor

This minor can be declared through the Department of Economics and Business.

The Department of Economics and Business offers a minor in economics. The economics minor is intended for cadets in other curricula who wish to supplement their major with a further study of economic theory. Cadets are required to complete EC 201, EC 202, EC 303*, and four additional economics electives at the 300 or 400 level (these may include EC 300 and EC 330). To pursue a minor in economics, cadets must obtain the permission of the Head of the Department of Economics and Business and the head of the department of their major field. The necessary application form can be obtained from the Head of the Department of Economics and Business. Cadets must maintain an overall 2.0 in the minor and complete all required course work with a grade of "C" or higher. All required courses must be taken at VMI. In addition, no more than two elective courses can be taken at another school.

*Competency in statistics can be demonstrated by receiving a "C" or higher in MA 101 and MA 102 or MA 220 or MA 326 in lieu of EC 303.

Exercise Science Minor

This interdisciplinary minor can be declared through the department of physical education or the department of biology.

The Minor in Exercise Science is designed to provide cadets with a comprehensive introduction to the foundations of exercise and fitness. It will prepare cadets to be eligible to sit for the American College of Sports Medicine Health and Fitness Instructor Certification Examination or the National Strength and Conditioning Association Certified Strength and Conditioning Specialist, and Tactical Strength and Conditioning—Facilitator Examinations.

Requirements for the Minor in Exercise Science

The exercise science minor requires a minimum of **16 hours** of specified course work **beyond** BI 101 and BI 102 or BI 111 and BI 112 (*indicates lab courses).

Required Courses (10 hours):

BI 101 and BI 102 or BI 111 and BI 112 are core science requirements for the exercise science minor. Additional required courses are:
PE 324—Exercise Physiology Credit Hours: 4 *
PE 380—Kinesiology and Functional Anatomy Credit Hours: 3
PE 433—Nutrition Credit Hours: 3

Optional Courses: (minimum 6 hours)

Must choose any two courses below
BI 204—Physiology Credit Hours: 4 *
BI 304—Comparative Vertebrate Morphology Credit Hours: 4 *
CH 262—Public Health issues Credit Hours: 3
PE 340—Teaching Mentorship in Physical Education Credit Hours: 1-3
PE 190—Independent Research Credit Hours: 1-3
PE 290—Independent Research Credit Hours: 1-3
PE 431—Physical Activity and Wellness Through the Lifespan Credit Hours: 3
PE 432—Concepts of Strength Training and Conditioning Credit Hours: 3
PE 490—Exercise Science Internship Credit Hours: 3
PS 309—Fundamentals of Biopsychology (formerly PS 203—Biopsychology I) Credit Hours: 3
PS 317—Sports Psychology Credit Hours: 3
PS 321—Stress and Health Credit Hours: 3

PE Elective Offerings:

All cadets enrolled in the exercise science minor must take 1.5 credits from the following courses as part of their 4.0 credit core requirement for physical education.
PE 200—Drug and Alcohol Abuse Awareness Credit Hours: 0.5
PE 306—Nutrition and Cardiovascular Health Credit Hours: 0.5
PE 325—Understanding Sports Injuries Credit Hours: 0.5
PE 327—Passive Stretching and Yoga Exercise Credit Hours: 0.5
PE 328—Stress Reduction and Mindfulness Credit Hours: 0.5
PE 405—Dietary Supplements Credit Hours: 0.5
PE 411—Fundamentals of Resistance Training Credit Hours: 0.5
PE 412—Weight Training Credit Hours: 0.5
PE 413—Cardiovascular Training Application Credit Hours: 0.5

History Minor

This minor can be declared through the Department of History

A minor in history is available to cadets majoring in other curricula. The requirements for a minor are HI 103, HI 104, HI 205 or HI 205W and HI 206, all with a grade of C or better, and twelve additional hours of history electives to total twenty-four hours of history.

International Studies Minor

This minor can be declared through the Department of: International Studies and Political Science

Cadets majoring in other curricula may fulfill the requirements for the IS minor by taking 18 semester credit hours of international studies and political science courses outside their major curriculum. Required courses for the minor include IS 310 or HI 324, or HI 325, and IS 220 and IS 320.

History majors who choose to fulfill the requirements for the minor by taking HI 324 or HI 325 are still required to take 18 credit hours outside their major (21 hrs. total). History majors who take IS 310 can complete the minor with 18 credit hours.

Leadership Studies Minor

The Department of Psychology offers an interdisciplinary minor in Leadership Studies.

This minor can be declared through the Department of Psychology

Requirements:

To be eligible for the Leadership Studies minor requires a grade of C or better in PS 344—Leadership in Organizations, a course which is required of all cadets. Additionally, the Leadership Studies minor requires a minimum of 18 hours in leadership studies, with a grade of C or better in each course. Upon electing to minor in Leadership Studies, the cadet must obtain approval of the Department Head in his or her own department, and from the Head of the Department of Psychology.

Required Courses (6 hours):

All cadets must complete PS 201—Introduction to Psychology and PS 302—Social Psychology.

Electives (12 hours):

Select one course from each of the following groups:

Electives Group A:

BU 220—Principles of Management Credit Hours: 3
BU 306—International Business Credit Hours: 3
BU 322—Human Resource Management Credit Hours: 3
EC 340—Entrepreneurship Credit Hours: 3

Electives Group B:

HI 350—French Revolution and Napoleon Credit Hours: 3
IS 310—American Foreign Policy Credit Hours: 3
IS 311—The American Congress Credit Hours: 3
IS 312—The American Presidency Credit Hours: 3
IS 320—National Security Policy Credit Hours: 3
IS 423W—Studies in Grand Strategy Credit Hours: 3
IS 442—Law, Morality, and Power Credit Hours: 3

Electives Group C:

ERH 201—Rhetorical Traditions I Credit Hours: 3
ERH 202—Rhetorical Traditions II Credit Hours: 3
ERH 207—Ethics Credit Hours: 3
ERH 301—Rhetoric and Public Address Credit Hours: 3
ERH 332—Logic and Critical Thinking Credit Hours: 3

Electives Group D:

PS 308—Motivation Credit Hours: 3
PS 315—Theories of Personality Credit Hours: 3
PS 317—Sports Psychology Credit Hours: 3
PS 320—Positive Psychology Credit Hours: 3
PS 495W—Independent Project in Leadership Studies Credit Hours: 3

Rationale:

Through an interdisciplinary curriculum, we seek to develop in each qualified cadet a base of knowledge about leadership and its application. The intent of this minor is to allow cadets to enhance their knowledge of the leadership process, while simultaneously contributing to an increase in their personal effectiveness as a leader.

Literary Studies Minor

This minor can be declared through the department of English, Rhetoric, and Humanistic Studies.

Cadets who pursue the Literary Studies Minor will analyze significant works of literature in the context of the traditions and cultures that shaped and were shaped by them. Cadets will utilize various critical approaches to evaluate, understand, and respond to works from a variety of genres and historical periods in order to appreciate the important role of literature in reflecting and shaping one's values, beliefs, and practices. In addition to studying the works of established writers, Cadets will compose their own creative works.

Required:

ERH 205—British Literary Traditions Credit Hours: 3
ERH 206—American Literary Traditions Credit Hours: 3
Four courses, at least one which is at the 300- or 400-level:
ERH 203—Ways of Reading Credit Hours: 3
ERH 222—Genre Studies—Poetry Credit Hours: 3
ERH 223—Genre Studies—Fiction Credit Hours: 3
ERH 224—Genre Studies—Nonfiction Credit Hours: 3
ERH 304—Language and Style Credit Hours: 3
ERH 321—British Literature in Cultural Context Credit Hours: 3
ERH 322—American Literature in Cultural Context Credit Hours: 3
ERH 323—Philosophy and Literature Credit Hours: 3
ERH 331—Aesthetics Credit Hours: 3

Note:

When appropriate, other courses may be substituted, e.g., ERH 230—Artistic Responses to Social and Political Issues, ERH 421—One Text, and ERH 422—Major Figures. A notation will be included on the course schedule so that cadets are aware of this possibility.

Mathematics Minor

This minor can be declared through the Department of: Applied Mathematics

Minor Requirements

A minor in mathematics is offered to cadets who desire to complement their major area of study with mathematics. The following courses are required for the minor:
MA 103—Matrix Algebra Credit Hours: 2
MA 123—Calculus & Analytic Geometry I Credit Hours: 3
MA 124—Calculus & Analytic Geometry II Credit Hours: 3
MA 215—Calculus With Analytic Geometry III Credit Hours: 4
MA 220—Probability & Statistics for Engineers & Scientists Credit Hours: 3
or
MA 326—Probability and Statistics Credit Hours: 3

Additional Requirements

» Nine additional semester hours chosen from MA courses numbered 300 and above. Three of these hours may be satisfied with one of HNS 377W, HNS 381WX, or MA 330WX. At least a 2.0 GPA must be maintained for courses within the minor field.
» Cadets cannot use both MA 220 and MA 326 towards the minor.

To become a candidate for the minor, the cadet must obtain the approval of both the Head of the Department of Applied Mathematics and the head of the department in the major field.

Middle Eastern Studies Minor

This interdisciplinary minor can be declared through the Department of History. It is designed to give cadets a broad introduction from different disciplinary perspectives to the history and culture of one of the most important regions of the world. Study abroad is strongly encouraged, as is Arabic language study. AR 481 is listed as an eligible course to apply to the minor. Other appropriate study abroad courses may be included in the minor with prior approval.

Requirements for the Minor in Middle Eastern Studies

This minor requires a minimum of **18** hours beyond the Institute Core Curriculum courses in World History (HI 103 and HI 104).

Required Courses (3 hours):

In addition to HI 103 and HI 104, one of the following must be taken:
ERH 211—Comparative Religion Credit Hours: 3
HI 312—Introduction to the History of Islam Credit Hours: 3
AR 481—Survey of Moroccan Culture and Society Credit Hours: 3

Optional Courses

(minimum of 15 credits, but no more than six credits from AR designated course):
HI 312—Introduction to the History of Islam Credit Hours: 3
HI 333—History of the Middle East I Credit Hours: 3
HI 334—History of the Middle East II Credit Hours: 3
HI 460W—Capstone Experience Credit Hours: 3
when the topic pertains to Middle Eastern history.
IS 421X—The Politics of Terrorism Credit Hours: 3
AR 314—Arabic Civilizations and Cultures Credit Hours: 3
AR 315—Arabic for the Media Credit Hours: 3
AR 408—Arabic Literature of the 19th Century Credit Hours: 3
AR 409—Arabic Literature of the 20th Century Credit Hours: 3
AR 418—Arabic for Business Credit Hours: 3
AR 420—Arabic Poetry Credit Hours: 3
Or other suitable topical courses as approved.

Military History Minor

This minor or concentration can be declared through the Department of: History

A minor in Military History is available to cadets majoring in other curricula. The requirement for the military history minor are HI 103, HI 104, HI 205 or HI 205W and HI 206 all with a grade of C or better, and twelve additional hours of military history electives to total twenty four hours of history.

This option is available to history majors as a concentration in military history. They must complete twelve hours of military history electives. Cadets must also meet all other requirements such as regional distributions.

Modern Languages Minor—Arabic, French, German, Spanish, Etc.

This minor can be declared through the Department of: Modern Languages and Cultures

A cadet who wishes to earn a minor in Modern Languages must complete a "Minor Declaration Form" for each language in which he or she wishes to earn a minor.

A cadet may earn a minor in Modern Languages by successfully completing the equivalent of 24 credit hours of the chosen language, beginning at the 100-level (6 hours), continuing through the 200-level (6 hours) to the 300-level. A maximum of nine hours may be taken from among the 300-level courses and a minimum of 3 hours must be taken at the 400-level. If a cadet qualifies for a minor in more than one language, he or she will be awarded a minor in each language.

Every cadet who minors in Modern Languages is strongly urged to study in a country where his or her foreign language is the principal tongue. Courses taken elsewhere and requests for alternate configurations of a minor must be approved in advance by the head of the Department of Modern Languages. Institute regulations require a cadet to maintain a C average (2.00 GPA) in all minor courses.

National Security Minor

This minor can be declared through the Department of: International Studies and Political Science

Cadets can embark on a twenty-one credit-hour curriculum leading to a National Security Minor (NSM).

This minor is especially valuable for academically ambitious cadets who intend to pursue:

› Graduate study in the fields of international security, foreign policy, or strategic studies.
› Careers in the military or civilian sectors related to matters of national security such as intelligence, diplomacy, area studies, and international relations.

The Minor allows cadets to concentrate on a particular aspect of national security and strategic studies. Concentrations may include energy, economic health of the US, education, state of the environment, as well as more traditional aspects of defense policy, diplomacy, international relations, and foreign area studies.

The Minor is limited to 10 cadets per class. Applicants must be in their third class year and have an overall 3.0 or better GPA. Selection is based on grades, defined interests, a writing sample, and recommendations of faculty members.

NSM participants have access to special trips which in the past have included: The National Security Council, the Department of Defense and other "3-letter" national security agencies, and influential think tanks in Washington, D.C. They are expected to take part in at least one national or international competition involving prestigious institutions in national security studies.

While the minor's focus is on national security, it is open to cadets from all departments.

The course work for the NSM consists of three predetermined courses, an additional elective four courses, and a paid summer internship related to national security.

Most importantly, the NSM requires a supervised senior thesis. The thesis is substantial research paper conducted under the supervision of a faculty member with familiarity in the subject matter. The thesis is expected to be 12,000-14,000 words (including footnotes) in length. The thesis will answer a question relating to national security through rigorous analysis employing discipline-specific methodologies.

In some cases, the paper can serve as a departmental or Institute honors thesis but additional academic credit cannot be earned for the paper beyond the 3 hours granted by the National Security Minor.

To apply or for information, contact: LTC Spencer Bakich: *bakichsd@vmi.edu*

National Security Minor Academic Requirements

A: Course work at VMI:

Total 21 credit hours (3 required courses and 4 electives)

1. Nine predetermined credit hours:

IS 320—National Security Policy Credit Hours: 3
IS 460W—Research Design for Political Science Credit Hours: 3
IS 485—National Security Minor Capstone Credit Hours: 3

2. Category I:

Three IS elective credit hours that may include the following courses, or another course that is more relevant to the cadet's national security interests.

IS 322—Intelligence and Policy Credit Hours: 3
IS 328—Multinational Peacekeeping Credit Hours: 3
IS 329—Counterinsurgency Credit Hours: 3
IS 334X—Politics of Central Asia Credit Hours: 3
IS 352—International Law Credit Hours: 3
IS 421X—The Politics of Terrorism Credit Hours: 3
IS 424WX—Regional Politics and Powers Credit Hours: 3
IS 443—The Morality of War Credit Hours: 3

3. Category II:

Nine elective credit hours from departments other than International Studies to include History, Psychology, Economics, Engineering, Math, and the sciences.

In consultation with their adviser and director of the minor, NSM cadets are encouraged to find courses that inform their thesis research. NSM cadets must request permission to have these courses meet the class hour requirements for Category I and Category II.

B. NSM Thesis (3 credits):

The Senior Project Experience will produce a substantial research paper, conducted under the supervision of a faculty member with familiarity in the subject matter. The paper is expected to be 12,000-14,000 words (including footnotes) in length and through rigorous analysis answer a question relating to national security.

Philosophy Minor

This minor can be declared through the department of English, Rhetoric, and Humanistic Studies.

This Minor in Philosophy will develop cadets' skills in analytical reasoning, critical thinking, argumentation, and textual analysis. Application of these skills is essential for the citizen-soldier, for each sharpens the cadet's ability to evaluate and reason, learn from others, and communicate. Cadets will explore the works of great philosophers from Plato and Aristotle to Nietzsche and Wittgenstein, and review questions in ethics, metaphysics, epistemology, and the philosophy of mind. Cadets will practice formulating arguments in written works and test their ability to analyze and synthesize knowledge in oral discussions.

Two of the following are required:

ERH 207—Ethics Credit Hours: 3
ERH 212—Ancient Greek and Medieval Philosophy Credit Hours: 3
ERH 213—Modern and Contemporary Philosophy Credit Hours: 3

Four courses, at least one which is at the 300- or 400-level:

ERH 207—Ethics Credit Hours: 3
ERH 212—Ancient Greek and Medieval Philosophy Credit Hours: 3
ERH 213—Modern and Contemporary Philosophy Credit Hours: 3
ERH 201—Rhetorical Traditions I Credit Hours: 3
or
ERH 202—Rhetorical Traditions II Credit Hours: 3
ERH 240—Poverty and Human Capability Credit Hours: 3
ERH 323—Philosophy and Literature Credit Hours: 3
ERH 331—Aesthetics Credit Hours: 3
ERH 332—Logic and Critical Thinking Credit Hours: 3

Note:

When appropriate, other courses may be substituted, e.g., ERH 421—One Text and ERH 422—Major Figures. A notation will be included on the course schedule so that cadets are aware of this possibility.

Physics Minor

This minor can be declared through the Department of Physics and Astronomy

A minor in physics is offered to cadets who desire to complement their major area of study with additional work in the field of physics. The requirements that must be satisfied are as follows:

1. General Physics Sequence

PY 160—General Physics I Credit Hours: 3
PY 161—General Physics II Credit Hours: 3
PY 155—General Physics Laboratory I Credit Hours: 1
PY 156—General Physics Laboratory II Credit Hours: 1

2. Modern Physics

PY 335—Modern Physics I Credit Hours: 3

3. Additional Hours (6 minimum)

Those courses must be selected from the following:

AT 306—Introductory Astrophysics Credit Hours: 3
PY 223—Programming and Data Analysis Credit Hours: 2
PY 253W—Optics Laboratory Credit Hours: 1
PY 254—Optics Credit Hours: 3
PY 262—General Physics III Credit Hours: 3
PY 308—Introduction to Nanotechnology Credit Hours: 3

PY 333W—Modern Physics Laboratory Credit Hours: 1
PY 334—Nuclear Physics Laboratory Credit Hours: 1
PY 341—Electricity and Magnetism I Credit Hours: 3
PY 342—Electricity and Magnetism II Credit Hours: 3
PY 344—Nuclear Physics Credit Hours: 3
PY 345—Lasers and Their Applications Credit Hours: 3
PY 336—Modern Physics II Credit Hours: 3
PY 441—Classical Mechanics I Credit Hours: 3
PY 446—Thermal Physics Credit Hours: 3
PY 453—Nuclear Reactor Engineering Credit Hours: 3
PY 257—Electronics and Interfacing Credit Hours: 4
PY 459—Introduction to Quantum Mechanics Credit Hours: 3
PY 460—Topics in Quantum Mechanics Credit Hours: 3
4. A minimum GPA of 2.0 is required in all courses required for the minor.

Note:

A cadet who wishes to apply for the physics minor must do so prior to the spring semester of the Second Class (junior) year. Contact the head of the Department of Physics and Astronomy for details.

Psychology Minor

This minor can be declared through the Department of Psychology.

To qualify for a minor in psychology, a minimum of 18 hours in psychology with a grade of C or better in each course must be completed.

Required Course (3 hours)

PS 201—Introduction to Psychology Credit Hours: 3

One Elective from Core A (3 hours)

PS 301—Psychology of Learning Credit Hours: 3
PS 401—Psychology of Cognition Credit Hours: 3
PS 404—History and Systems in Psychology Credit Hours: 3

One Elective from Core B (3 hours)

PS 302—Social Psychology Credit Hours: 3
PS 305—Abnormal Psychology Credit Hours: 3
PS 315—Theories of Personality Credit Hours: 3

One Elective from Core C (3 hours)

PS 307—Developmental Psychology Credit Hours: 3
PS 309—Fundamentals of Biopsychology (formerly PS 203—Biopsychology I) Credit Hours: 3
PS 314—Physiology and Behavior (formerly PS 204—Biopsychology II) Credit Hours: 3

Two Courses from Core D (6 hours)

6 hours of any additional PS courses, including those listed in Cores A, B, or C excluding PS 344.

Note

Upon electing to minor in psychology, approval must be obtained from the major curriculum head and the head of the Department of Psychology.

Rhetoric and Writing Minor

This minor can be declared through the department of English, Rhetoric, and Humanistic Studies.

Cadets who minor in Rhetoric and Writing will examine the philosophical and ethical foundations of rhetoric while developing and practicing the skills necessary for effective communication in public, professional, and private spheres. They learn to analyze rhetorically complex acts of communication (texts, speeches, images, gestures) by taking into consideration socio-political, historical, and cultural contexts in order to better understand human motives and enhance cooperation through the effective use of language.

Required:

ERH 201—Rhetorical Traditions I Credit Hours: 3
ERH 202—Rhetorical Traditions II Credit Hours: 3
Four courses, at least one which is at the 300- or 400-level:
ERH 207—Ethics Credit Hours: 3
ERH 212—Ancient Greek and Medieval Philosophy Credit Hours: 3
ERH 221—Digital Rhetorics Credit Hours: 3
ERH 222—Genre Studies—Poetry Credit Hours: 3
ERH 223—Genre Studies—Fiction Credit Hours: 3
ERH 224—Genre Studies—Nonfiction Credit Hours: 3
ERH 230—Artistic Responses to Social and Political Issues Credit Hours: 3
ERH 250—Teaching Writing Credit Hours: 3
ERH 301—Rhetoric and Public Address Credit Hours: 3
ERH 302—Civic Discourse Credit Hours: 3
ERH 303—Cultural Rhetorics Credit Hours: 3
ERH 304—Language and Style Credit Hours: 3
ERH 311-313—Professional Writing (Discipline/Field Specific) Credit Hours: 3
ERH 314—Technical Communication Credit Hours: 3
ERH 411—Fieldwork Credit Hours: 3
ERH 470-479—Seminar in Rhetoric and Writing Credit Hours: 3

Note:

When appropriate, other courses may be substituted, e.g., ERH 421—One Text, ERH 422—Major Figures, and ERH 495-496 Honors Thesis I & II. A notation will be included on the course schedule so that cadets are aware of this possibility. In addition, one Writing Intensive (W) course may be substituted for one Rhetoric/Writing elective.

Special Programs

VMI offers a number of exciting special programs that enhance the primary academic experiences provided in our majors and minors, demonstrating the Institute's full commitment to educating the whole man and woman. For more information about these and other special programs, please visit our website: *http://www.vmi.edu/specacadprog*.

Institute Honors Program

The Institute Honors Program was developed to enrich the academic experience of VMI's outstanding cadets through activities that encourage an affinity for intellectual inquiry and develop the capacity for sophisticated engagement of issues and problems, whether ethical, civic, or professional. In all of its elements, the program stresses peer leadership, strong oral and written communication skills, and the highest standards of academic integrity and excellence. The Institute Honors Program recognizes a broader range of achievement than honors earned in a particular major. Attainment of Institute Honors is viewed as the highest academic achievement at VMI. The program is open by application to any cadet with a 3.5 or higher GPA. For further information about the program, see the Associate Dean for Academic Affairs, 210 Smith Hall.

Institute Writing Program

The Institute Writing Program seeks to equip cadets for both academic success and participation in the full range of rhetorical occasions they will encounter in their lives as citizens and professionals. The program links three important components of the VMI curriculum: our rigorous core curriculum sequence in first-year composition (ERH 101 and ERH 102); a thriving Writing Across the Curriculum initiative, which requires cadets to complete two additional "writing-intensive" courses prior to graduation; and an interdisciplinary minor in writing for those who wish to pursue advanced training in rhetoric, technical, professional, or creative writing. Cadets' study in the writing curriculum is enhanced by consultants in the VMI Writing Center, who consult individually with cadets at any stage of a writing project. The program sponsors annual writing contests for cadets, local workshops, a nationally regarded symposium for professors of rhetoric and composition, and several presentations on Post each year featuring writers in all genres. For more information, see the Institute Director of Writing, 232 Scott Shipp Hall.

International Programs

Preparing young men and women for successful service in an increasingly international and interdependent world community, by broadening their global perspectives and increasing their cultural awareness, is an inherent component of the Virginia Military Institute's mission of educating citizen-soldiers. The VMI Office of International Programs strives to provide cadets top-quality opportunities for international education and experiences through study abroad, military exchanges, educational travel, internships, and international academic and cultural events on Post, throughout the nation and around the world. Additionally, we provide support services to international cadets, both four-year VMI cadets and military exchange cadets, to include advising on issues related to visa status, as well as helping international cadets adjust to US and VMI cultures. For more information, please contact the Office of International Programs in the Old Hospital, Room 101.

Internship Programs

VMI works actively to assist cadets in any major who seek internship experiences that will allow them to apply/test career interests and demonstrate their abilities to prospective employers. Internships are available in all geographic areas of the United States and internationally as well. Some are eligible for academic credit, and many of them include stipends for work completed. For more information, contact the Office of Career Services, 311 Carroll Hall.

Summer Session

The VMI Summer Session facilitates cadet progression toward degree completion by offering courses for academic credit during the summer, consistent with the Academic Program Mission. The program is designed to enhance cadet retention, to optimize graduation rates, to provide opportunities for cadets to enrich their education, and to enable cadets to attend the Summer Session and also attend ROTC summer camps, engage in internships, and earn income. It provides the opportunity for cadets to meet curricular, scholarship, athletic, or readmission standards, by enabling them to earn credit for subjects in which they stand deficient or by receiving credit for courses in advance of their class. Summer study allows cadets to broaden their education by earning a double major or minor and facilitates transfer from one curriculum to another. In addition to traditional course offerings the Summer Session also administers the Summer Undergraduate Research Institute, the Summer Study Abroad Program, and the Summer Transition Program. VMI cadets, graduates of accredited secondary schools, and students in good standing at other colleges may attend. High school students who have been promoted to the twelfth grade and have the written approval of their principal are also eligible to attend. For details about scheduling and other admission requirements, please contact the Director of the Summer Session, 306 Shell Hall.

VMI Center for Undergraduate Research

The VMI Center for Undergraduate Research (V-CUR) is both a program and a centralized office with the mission of promoting and facilitating faculty-mentored undergraduate research and fostering the development of a culture of undergraduate research at VMI. VCUR operates on the premise that some of the most enduringly meaningful academic experiences of college students come through opportunities to be mentored one-on-one by faculty outside the classroom, while also believing in the merit of research and other inquiry-based experiences within a more traditional classroom setting. V-CUR simultaneously nurtures existing mentoring efforts and coordinates new institutional support for joint investigative projects by faculty members and cadets. Programs include an annual undergraduate Research Symposium held on Post; a Summer Undergraduate Research Institute; cadet travel grants to present at professional meetings or conduct research in the field; Wetmore Fund for supplies for cadet academic year research; and awards to encourage and acknowledge faculty who engage cadets in undergraduate research experiences. For more information, contact the Director Undergraduate Research, 300 Preston Library.

Courses of Instruction

Course Numbering System.

Each subject is identified by a symbol made up of two parts. The first part is an abbreviation denoting the general field of study. The second part is a number denoting the particular subject. The first digit indicates the year in which the course is usually taken and, therefore, the level of instruction.

Credit.

The unit of academic credit used at the Virginia Military Institute is the semester hour. In general a semester hour represents one hour of classroom work (lecture or recitation) or one period (two or three hours) of laboratory or supervised research or field work per week during a single semester. Thus a course that meets for three class hours and one laboratory period each week during one semester usually carries credit for four semester hours.

In the following course descriptions the figures on the title lines indicate, in order, the class hours per week, the laboratory or field work hours per week, and the semester hours credit. For example, the figures "3—2—4" mean that the class meets three times a week for one-hour classroom sessions and has two hours of laboratory, supervised research, or field work each week, and that the course carries four semester hours of credit.

Aerospace Studies

Department of Aerospace Studies

Department Head: Col. Biggs

Curriculum is delivered in accordance with applicable service regulation and instruction.

AS 103—Heritage and Values of the United States Air Force I

Lecture Hours: 1 **Lab Hours:** 0 **Credit Hours:** 1

AS-103 is part I of a survey course offered during the fall semester and is designed to introduce students to the Air Force and its various opportunities. Additionally, the course examines and evaluates the various traits of effective leaders in and outside of the Air Force. Prerequisite(s): Must meet AFROTC membership requirements and be seeking a commission. Corequisite(s): AS 113

AS 104—Heritage and Values of the United States Air Force II

Lecture Hours: 1 **Lab Hours:** 0 **Credit Hours:** 1

AS-104 is part II of a survey course offered during the spring semester that introduces students to the Air Force and its various opportunities. Additionally, the course examines and evaluates the various traits of effective leaders in and outside of the Air Force. Corequisite(s): AS 114

AS 113—Leadership Lab for AS 103

Lecture Hours: 0 **Lab Hours:** 1 **Credit Hours:** 0

This mandatory, fall semester leadership lab allows cadets to practice and demonstrate mastery of the leadership skills essential to an Air Force officer.

AS 114—Leadership Lab for AS 104

Lecture Hours: 0 **Lab Hours:** 1 **Credit Hours:** 0

This mandatory, spring semester leadership lab allows cadets to practice and demonstrate mastery of the leadership skills essential to an Air Force officer.

AS 203—Team and Leadership Fundamentals I

Lecture Hours: 1 **Lab Hours:** 0 **Credit Hours:** 1

AS-203 is part I of a survey course offered during the fall semester that provides a fundamental understanding of both leadership and team building. The course is a vehicle for students to become well-rounded Air Force officers through the demonstration of verbal/written communication skills and hands on application that students will apply at Field Training, which follows the AS-200 year. Prerequisite(s): Must meet AFROTC membership requirements and be seeking a commission. Corequisite(s): AS 213

AS 204—Team and Leadership Fundamentals II

Lecture Hours: 1 **Lab Hours:** 0 **Credit Hours:** 1

AS-204 is part II of a survey course offered during the spring semester, and is designed to expand on the fundamental understanding of both leadership and team building covered during the spring semester. Students will continue to utilize and improve his/her verbal and written communication skills and demonstrate capabilities and requirements of leadership that will be evaluated at Field Training, which follows the AS-200 year. Prerequisite(s): Must meet AFROTC membership requirements and be seeking a commission. Corequisite(s): AS 214

AS 213—Leadership Lab for AS 203

Lecture Hours: 0 **Lab Hours:** 1 **Credit Hours:** 0

This mandatory, fall semester leadership lab allows cadets to practice and demonstrate mastery of the leadership skills essential to an Air Force officer.

AS 214—Leadership Lab for AS 204

Lecture Hours: 0 **Lab Hours:** 1 **Credit Hours:** 0

This mandatory, fall semester leadership lab allows cadets to practice and demonstrate mastery of the leadership skills essential to an Air Force officer.

AS 303—Leading People and Effective Communication I

Lecture Hours: 2 **Lab Hours:** 0 **Credit Hours:** 2

This course designed to build on the leadership fundamentals taught in AS200, and is offered during the fall. Cadets will utilize their skills as they assume leadership roles in the detachment. The goal is for cadets to have a more in-depth understanding of how to effectively lead people, and provide them with the tools to use throughout their detachment leadership positions. Secondly, cadets will hone their writing and briefing skills. The course continues into advanced skills and ethics training that will prepare them for becoming an officer and a supervisor. Corequisite(s): AS 313 for seeking/commissioing cadets or LS 350 for non-commissioing cadets. Failure to take LS 350 with ROTC course will result in a grade of F in the ROTC course.

AS 304—Leading People and Effective Communication II

Lecture Hours: 2 **Lab Hours:** 0 **Credit Hours:** 2

This course designed to build on the leadership fundamentals taught in AS200, and is offered during the spring. Cadets will utilize their skills as they begin more of a leadership role

in the detachment. The goal is for cadets to have a more in-depth understanding of how to effectively lead people, and provide them with the tools to use throughout their detachment leadership positions. Secondly, cadets will hone their writing and briefing skills. The course continues into advanced skills and ethics training that will prepare them for becoming an officer and a supervisor. Corequisite(s): AS 314 for seeking/comissioning cadets or LS 351 for non-commissioning cadets. Failure to take LS 351 with ROTC course will result in a grade of F in ROTC course.

AS 313—Leadership Lab for AS 303

Lecture Hours: 0 **Lab Hours:** 1 **Credit Hours:** 0

AS-313 AFROTC Leadership Lab for seeking/commissioning cadets or LS-350 for non-commissioning cadets. Failure to take LS-350 with ROTC course will result in a grade of F in the ROTC course.

AS 314—Leadership Lab for AS 304

Lecture Hours: 0 **Lab Hours:** 1 **Credit Hours:** 0

AS-314 AFROTC Leadership Lab for seeking/commissioning cadets or LS-351 for non-commissioning cadets. Failure to take LS-351 with ROTC course will result in a grade of F in the ROTC course.

AS 403—National Security, Leadership Responsibilities and Commissioning Preparation I

Lecture Hours: 2 **Lab Hours:** 0 **Credit Hours:** 2

This course exposes cadets to basic elements of national security policy, air and space power operations, and the role of the military in society. It also discusses current domestic and international issues affecting the military profession. Cadets will develop understanding of the responsibility, authority, and functions of an Air Force commander and selected provisions of the military justice system. Corequisite(s): AS 413 for seeking/commissioning cadets or LS 350 for non-commissioning cadets. Failure to take LS 350 with ROTC course will result in a grade of F in the course.

AS 404—National Security, Leadership Responsibilities and Commissioning Preparation II

Lecture Hours: 2 **Lab Hours:** 0 **Credit Hours:** 2

The final semester of the AS400 year is designed to prepare cadets for life as a second lieutenant. It covers the officer and enlisted evaluation systems, pay and benefits, career progression, and the commissioning oath. Corequisite(s): AS 414 for seeking/commissioning cadets or LS 451 for non-commissioning cadets. Failure to take LS 451 with ROTC course will result in a grade of F in the ROTC course.

AS 413—Leadership Lab for AS 403

Lecture Hours: 0 **Lab Hours:** 1 **Credit Hours:** 0

AS-413 AFROTC Leadership Lab for seeking/commissioning cadets or LS-450 for non-commissioning cadets. Failure to take LS-450 with ROTC course will result in a grade of F in the ROTC course.

AS 414—Leadership Lab for AS 404

Lecture Hours: 0 **Lab Hours:** 1 **Credit Hours:** 0

AS-414 AFROTC Leadership Lab for seeking/commissioning cadets or LS-351 for non-commissioning cadets. Failure to take LS-351 with ROTC course will result in a grade of F in the ROTC course.

Applied Mathematics

Department of Applied Mathematics

Department Head: Col. Siemers

Requirements for a major in applied mathematics are specified in Applied Mathematics.

Note: All cadets must have at least six hours of mathematics. MA 114 does not fulfill a mathematics requirement and cannot be used as elective credit.

MA 101—Math that Matters I

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

In MA-101, cadets will learn mathematical concepts from statistics, including data analysis, regression, probability, sampling, statistical significance, and hypothesis testing.

MA 102—Math that Matters II

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

In MA-102, cadets will learn mathematical concepts of mathematical modeling and basic calculus, including rates of change and area calculation. In MA-102, cadets will also work in pairs to create a poster that will be presented. Prerequisite(s): MA 101

MA 103—Matrix Algebra

Lecture Hours: 2 **Lab Hours:** 0 **Credit Hours:** 2

Introduction to matrices. Matrix determinant and inverse. Elementary transformations and systems of linear equations: existence and uniqueness of solution, Cramer's Rule, Gaussian elimination with back-substitution. Introduction to linear transformations: eigenvalues and eigenvectors, matrix trace.

MA 105—Introduction to Probability and Statistics I

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A study of problem solving skills, counting principles, finite probability theory, descriptive statistics and the binomial and normal distributions. Computer/calculator applications will be chosen to enhance understanding of the topics.

MA 106—Introduction to Probability and Statistics II

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A continuation of MA 105. Topics include random variables, correlation, regression, confidence intervals, and hypothesis testing. Computer/calculator applications will be chosen to enhance understanding of the topics. Prerequisite(s): MA 105.

MA 110—Mathematical Software

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Introduction to the use of mathematical software packages Matlab and Mathcad in applied mathematics, engineering and physics.

MA 114—Pre-Calculus Mathematics

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Equations and inequalities; functions and their graphs; polynomial and rational functions; exponential and logarithmic functions; trigonometric functions. Required only for those cadets who plan to take MA 123. Beginning with the Class of 2014, this course is only offered on a pass/

fail basis and cannot be used towards program requirements. Note: All cadets must have at least six hours of mathematics. MA 114 does not fulfill a mathematics requirement and cannot be used as elective credit.

MA 123—Calculus & Analytic Geometry I

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Plane analytic geometry with single variable differential calculus. Limits, derivatives, applications of derivatives, and derivatives of transcendental functions and basic integration formulas. Prerequisite(s): Placement Test or Pass Grade in MA 114.

MA 124—Calculus & Analytic Geometry II

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A continuation of MA 123. Integration and its applications, methods of integration, L'Hopital's Rule, improper integrals, infinite sequences and series, Taylor Polynomials. Prerequisite(s): A grade of C or higher in MA 123.

MA 125—Quantitative Methods I

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A study of functions, linear and nonlinear models, systems of linear equations, matrices and applications, and an introduction to the mathematics of finance.

MA 126—Quantitative Methods II

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A study of the basic concepts of differentiation and integration to include partial derivatives and the Method of Lagrange emphasizing the techniques and applications relevant to business and economics. Prerequisite(s): C or better in MA 125.

MA 215—Calculus With Analytic Geometry III

Lecture Hours: 4 **Lab Hours:** 0 **Credit Hours:** 4

A continuation of MA 124; Conic sections, parametric equations, polar coordinates, vectors, vector-valued functions, partial derivatives, improper and multiple integrals. Prerequisite(s): A grade of C or higher in MA 124.

MA 220—Probability & Statistics for Engineers & Scientists

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This is a calculus-based treatment of probability and statistics designed for scientists and engineers. Topics would include: classification of data by graphical and numerical methods; intro to probability to include definitions and theorems; discrete random variables including binomial and Poisson distributions, expectation and variance calculations; continuous random variables to include uniform, exponential, normal, Weibull, Gamma, and Chi-squared distributions; hypothesis testing and least-squares linear regression. Prerequisite(s): MA 124.

MA 301—Higher Mathematics for Engineers and Scientists

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Vector analysis, infinite series convergence, Taylor and Maclaurin Series, Fourier Series and series solutions to differential equations. Prerequisite(s): MA 215 and MA 311.

MA 303—Advanced Calculus I

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A rigorous treatment of the following topics: limits, continuity, derivatives of real valued functions of a single real variable, Rolle's Theorem and the mean value theorem, L'Hopital's rule, sequences and series. Prerequisite(s): MA 124.

MA 304—Advanced Calculus II

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Implicit-function theorems; Jacobians; vector and scalar point functions; gradient; divergence; line, surface and volume integrals. Prerequisite(s): MA 303.

MA 305—Elementary Linear Algebra

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Vectors; matrices; determinants; systems of linear equations; linear transformations. A study of the theoretical and computational aspects pertaining to matrices and vector spaces, including: systems of linear equations, Gaussian elimination, LU decomposition, determinants, eigenvalues and eigenvectors, linear independence, span, bases, linear transformations, inner product spaces and least square approximation. Computer software packages will be introduced and utilized as part of the course. Prerequisite(s): MA 103 or permission of the instructor.

MA 306—Elementary Number Theory

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Properties of integers, prime numbers, number theoretic functions, congruencies. Diophantine equations. Prerequisite(s): Permission of the instructor.

MA 310—Matlab Programming

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Advanced MATLAB functionality, geometric techniques (Monte Carlo, random walks, and Levy Flights), and the brute force, nearest neighbor, simulated annealing, and genetic algorithms applied to the Traveling Salesman Problem (TSP). The course concludes with the development of a TSP graphical user interface (GUI) that integrates these algorithms. Prerequisite(s): MA 110, ME 203, or PY 223.

MA 311—Elementary Differential Equations

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Ordinary differential equations; applications; Laplace transforms; Systems of ODEs. Prerequisite(s): MA 124.

MA 319—Mathematical Methods of Operations Research

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Mathematical modeling, linear programming, allocation models, network models, scheduling models. Prerequisite(s): MA 103 and MA 124.

MA 320—Mathematical Modeling

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course considers a variety of mathematical models in the physical, life, and social sciences. In addition to analyzing models, a major component of the course is using computational tools to construct mathematical models and test their validity against empirical data. Prerequisite(s): MA 110 and MA 311

MA 326—Probability and Statistics

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Simple, discrete, and continuous probability distributions. Sampling from probability distributions and finite populations. Prerequisite(s): MA 215

MA 330WX—History of Mathematics

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This is a topics course in the history of mathematics beginning with the ancients. This is a guided tour of the most important aspects from the beginnings of recorded mathematical activity through the development of calculus. Topics beyond the development of the calculus will be covered as time permits. Coverage includes the motives, influences, and methods

affecting the development of algebra, geometry, trigonometry, and calculus in Mesopotamian, Egyptian, Greek, Islamic, Indian, and European civilizations. Prerequisite(s): MA 123 or permission of instructor. Preference is given to AM Majors and Minors. Note: Writing Intensive (W) and Civilizations & Cultures Course (X).

MA 331X—History of Mathematics II

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

In this course, we consider the works and lives of mathematicians in Europe and the United States. We focus on major developments during the time frame from the development of the calculus in the late 1600s to the present day. We study mathematical contributions to fields such as geometry, number theory, and calculus as well as to physics and engineering and how each culture has supported mathematical discovery. Prerequisite(s): MA 124 Note: Civilizations & Cultures Course (X).

MA 341—Fractals

Lecture Hours: 1 **Lab Hours:** 0 **Credit Hours:** 1

Introduction to the mathematics of fractals with a focus on contractive affine maps, L-box transformations, 8 fractal dimensions, Julia sets and Mandelbrot sets. Prerequisite(s): MA 103 and one of MA 110/PY 223/ME 203

MA 342—Introduction to Mathematica

Lecture Hours: 1 **Lab Hours:** 0 **Credit Hours:** 1

An introduction to the computer algebra system Mathematica. Emphasis will be placed on symbolic computation, equation solving and graphics. The implementation of basic programming structures (such as Booleans and loops) in the Wolfram programming language will also be discussed.

MA 343—Introduction to LaTeX

Lecture Hours: 1 **Lab Hours:** 0 **Credit Hours:** 1

An introduction to the typesetting system LaTeX with an emphasis on producing technical documents that include mathematical equations.

MA 345—STK for Defense Applications

Lecture Hours: 1 **Lab Hours:** 0 **Credit Hours:** 1

Systems Tool Kit (STK) is the premier software packaged used by the Department of Defense and NASA to perform system analysis and visualization for aerospace and defense mission-level applications. In this one-credit course, cadets will have the opportunity to explore the broad range of capabilities of this software package, such as optimizing satellite constellations for a particular geocentric mission, estimating fuel consumption of a fighter jet as it tears through the sky at an air show, or analyzing the relative performance of different missile defense architectures against a suite of threat missiles. In-class time will be allocated to for cadets to work towards earning Level I STK Certification and completing the training for the Level II certification. Prerequisite(s): MA 215 with a minimum grade of C

MA 401—Modern Algebra

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Basic algebraic properties of groups, rings and fields.

MA 405—Statistics

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A continuation of MA 326; probability distributions, estimation, hypothesis testing, regression analysis and techniques of experimental design. Prerequisite(s): MA 326.

MA 407—Complex Variables

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Properties of complex numbers; analytic functions; power series, residues and poles; Laurent series. Prerequisite(s): MA 215

MA 415—Chaos and Nonlinear Dynamics

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Introduction to the mathematics of nonlinear dynamics of 1-dimesional and 2-dimesional models including: Fixed points, Linearization, Stability, Bifurcations (Saddle Node, Transcritical, Pitchfork and Hopf), Limit Cycles, Hysteresis, Strange Attractors, Liapunov Exponents and Fractals. Prerequisite(s): MA 311

MA 419—Intro to Non-Linear Optimization

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course is a continuation of MA-319 to include a review of linear programming using the Simplex algorithm & LINDO software; review of multivariable calculus topics; and a survey of various techniques for optimizing functions that are not in the realm of linear programming. The Kuhn-Tucker conditions are optimality are discovered. Techniques including branch & bound for integer programming and search methods for quadratic programming and other non-linear problems are covered. Prerequisite(s): MA 319 and MA 215

MA 426—Intro to Stochastic Process

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course introduces the student to stochastic models, discrete—and continuous-time stochastic processes, point and counting processes, Poisson counting processes, compound Poisson processes, non-stationary Poisson processes and Markov chains. Prerequisite(s): MA 326

MA 432—Numerical Analysis

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Numerical interpolation; error analysis; numerical solution of ordinary and partial differential equations and simultaneous linear equations. Recommended for cadets contemplating a career in computing. Prerequisite(s): MA 215, MA 311, and one of the following: MA 110, ME 203, or PY 223

MA 433—Numerical Solutions of Differential Equations

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Introduction to MATLAB. Numerical methods for ordinary differential equations: Taylor series, Euler and Modified Euler, Runge-Kutta. Multi-step methods, Milne's method, Adams—Moulton method. Convergence criteria and comparison of methods. Numerical methods for partial differential equations. Convergence, stability and consistency. Prerequisite(s): MA 311 or consent of instructor.

MA 451-459—Independent Study

Lecture Hours: 1-3 **Lab Hours:** 0 **Credit Hours:** 1-3

Selected areas such as topology, geometry, algebra, real analysis. Recommended for cadets contemplating doctoral programs in mathematics. Prerequisite(s): consent of department head.

MA 471-479—Topics in Mathematics

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Selected Topics in Mathematics Such As Graph theory, Topology, Dynamic Systems, Partial Differential Equations, Spline Approximation and Operator theory. Prerequisite(s): Permission of Department Head.

MA 490W—Research Practicum in Applied Mathematics

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Mathematics coursework. Prerequisite(s): 28 credit hours in Math coursework or First Class Standing. Writing Intensive (W)

MA 495—Advanced Research Projects in Applied Mathematics

Lecture Hours: 1-3 **Lab Hours:** 0 **Credit Hours:** 1-3

Taken for one credit, this course is intended to guide cadets through the Mathematics Competition in Modeling (MCM) contest. Taken for three credits, this course includes the MCM preparation and the extension to further research projects already established within MA 490W or other instructor-approved research projects. Prerequisite(s): MA 490W

Arabic

Department of Modern Languages and Cultures

Department Head: Col. Sunnen

All cadets who enter with two or more entrance units in a modern foreign language are given placement tests and are placed in appropriate courses on the basis of the test results combined with their previous high school language coursework, and after consultation with the department head of modern languages.

A single year of a foreign language shall count toward meeting graduation requirements only when the cadet is studying a second language or is taking a language as an elective.

Cadets must demonstrate proficiency in ML 101 in order to be admitted into ML 102. They must, similarly, demonstrate proficiency in ML 102 before enrolling in ML 201, and in ML 201 before enrolling in ML 202/204. Proficiency in ML 202/204 is a prerequisite for admission to 300-level courses. Completion of two 300-level courses or their equivalent is expected before enrollment in any 400—level course. Once a cadet has completed work at the 202/204 level, he/she may not return to the elementary level course for credit.

Cadets who present four years of a high school language or demonstrate native or near-native language abilities may not enroll at the elementary level of that language. Such students will have the choice of enrolling either in the first semester intermediate level of that language or in the first semester elementary course of a different language.

AR 101—Elementary Arabic I

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An introduction to the fundamentals of Arabic. Primary emphasis on the acquisition of basic language skills (comprehending, speaking, reading, and writing) within the context of culture and civilizations. Secondary emphasis on the cultures where Arabic is spoken. Intended for beginners with no previous experience in the language.

AR 102—Elementary Arabic II

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A continuation of AR 101. Prerequisite(s): AR 101.

AR 201—Intermediate Arabic I

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A continuation and systematic review of structural principles and an introduction to the reading and discussion of cultural materials and texts with the aim of improving the four basic language skills. Conducted as much as possible in Arabic. Prerequisite(s): AR 102.

AR 202—Intermediate Arabic II

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A continuation of AR 201 with emphasis on writing. This course is intended to consolidate the basic language skills and to prepare the student for advanced work in Arabic. Conducted as much as possible in Arabic. Readings based on civilization and culture. Prerequisite(s): AR 201.

AR 301W—Arabic Composition and Conversation I

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Designed to improve students' spoken and written command of Arabic. Discussions, oral reports, and writing assignments include topics in Arabic civilizations and cultural history. Conducted mainly in Arabic. Prerequisite(s): AR 202 Writing Intensive (W)

AR 302W—Arabic Composition and Conversation II

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A continuation of AR 301W. Prerequisite(s): AR 301W. Writing Intensive (W)

AR 314—Arabic Civilizations and Cultures

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A survey of the history, literature, educational systems and values of the Arab Word. The course will be based on readings from contemporary sources: Short stories, magazines, newspapers, literary works and legal documents. The course is designed to build on the reading and writing skills of AR 301W and AR 302W. It is also intended to enhance cadets' cultural awareness of contemporary issues, which affect the Arabic speaking world and the United States. Prerequisite(s): AR 301W, AR 302W.

AR 315—Arabic for the Media

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Emphasizes written and aural comprehension of Arabic media (newspapers, journals, radio and television, news broadcasts, and documentaries). The goal is to introduce and consolidate lexical items which commonly occur in the media and in economic and scientific texts. The principal language of instruction is Arabic. Prerequisite(s): Two AR 300's.

AR 316—Topics in Arabic

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Information and discussion of diverse topics from the Arabic-speaking world. The principal language of instruction is Arabic. Note: Retakes for credit. Prerequisite(s): Two AR 300's.

AR 405—Independent Readings

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Directed readings of major literary works. Conducted almost exclusively in Arabic. Note: Retakes for credit. Prerequisite(s): Completion of at least 9 hours beyond AR 202 or permission of the instructor and department head.

AR 407—Advanced Arabic Grammar and Syntax

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A systematic study of Arabic grammar and syntax. Emphasis also on vocabulary development and study of idiomatic expression. Prerequisite(s): Two AR 300's.

AR 408—Arabic Literature of the 19th Century

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A study of major movements and writers of the 19th century with special emphasis on Romantic poetry and prose. Conducted in Arabic. Emphasis on developing reading and writing skills. A research paper is required. Prerequisite(s): Two AR 300's.

AR 409—Arabic Literature of the 20th Century

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A study of major writers and poets of the 20th century with special emphasis on Naguib Mahfouz's Trilogy. A research paper is required. Prerequisite(s): Two AR 300's.

AR 410—Advanced Arabic

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Aimed at cadet acquisition of proficiency in Modern Standard Arabic. Audiovisual materials and authentic Arabic Texts will be the main sources of study. Students will be exposed to and expected to master a wide range of different texts, including excerpts from the Qur'an, newspaper articles, classical poetry and prose, modern fiction, and essays. Prerequisite(s): Two AR 300s.

AR 418—Arabic for Business

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An introduction to Business Arabic. Includes a review of the grammar and syntax of the Arabic language. The study of Arabic texts relevant to business and management practices in different Arab counties will provide cadets with a general cultural background of Arabic countries. Prerequisite(s): Two AR 300's.

AR 420—Arabic Poetry

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A survey of Arabic poetry from the advent of Islam to the present. Excerpts from the major works of prominent poets are studied for form and historical significance. Conducted in Arabic. Research paper required. Prerequisite(s): Two AR 300s.

AR 450—Modern Language Capstone Course

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

The student will choose a topic incorporating an analysis of historical, literary or cultural factors in the major language area—field experience and interdisciplinary topics are strongly encouraged. Upon approval of the faculty adviser, the student will prepare both a research paper and a 20-minute oral presentation. This course is only open to first and second class Modern Language majors or minors. The ML Capstone project will be written in the student's major foreign language, as appropriate, and it will achieve a language rating of "Advanced—High". All relevant documentation will adhere to MLA specifications. An accepted ML Honors Thesis could substitute for this course.

AR 470—Special Topics in Arabic

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An advanced topics course that will vary to reflect cadet and professorial interest. This course fosters a close reading of text and discussion of diverse topics from the Arab world to reinforce advanced language and cultural knowledge. Prerequisite(s): Two AR 300s.

AR 481—Survey of Moroccan Culture and Society

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A Moroccan history and civilization course during the VMI summer abroad program in Morocco. This course is primarily a culture class designed to educate students on Moroccan history through on-site excursions to historical places of interest with a guided tour. The course includes invited guest lectures by Moroccan academics. Topics cover Moroccan society such as the educational system, government relations, religion, Berber history, superstitions, and gender roles in Morocco among others. This course does not include a foreign language component and cannot be used toward a language requirement.

Astronomy

Department of Physics and Astronomy

Department Head: Col. Hodges

Requirements for a major in physics are specified in Physics and Astronomy.

AT 170—The Universe

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A one semester introductory general astronomy course for non-science majors. Topics covered include observations of the night sky, the solar system and its contents, the sun and the nature of stars, stellar evolution, galaxies and cosmology. Prerequisite(s): none

AT 201—Introductory Astronomy I

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An introductory course covering topics in modern astronomy. Topics include spherical astronomy, observational instruments, photometric concepts and radiation, celestial mechanics, and the solar system. Prerequisite(s): MA 124 or permission of the instructor.

AT 202—Introductory Astronomy II

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A continuation of AT 201. Topics include stellar spectra, binary stars, stellar structure, the Sun, stellar evolution, variable and compact stars, the interstellar medium, galaxies, and cosmology. Prerequisite(s): A grade of C or higher in AT 201 and MA 124 or permission of the instructor.

AT 250—Astrobiology

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A one semester course covering the evolution of stars and planets, protoplanetary environments, and habitable zones around stars. The course will also focus on potentially habitable regions in the solar system, characteristics of extrasolar planets, the search for microbial and intelligent life elsewhere in the Universe, and the origin and evolution of life on Earth.

AT 301—Observational Techniques

Lecture Hours: 3 **Lab Hours:** 2 **Credit Hours:** 4

Designed to provide a survey of astronomical tools and techniques used to obtain and understand astronomical data. Emphasis placed on photoelectric photometry to measure brightnesses and colors of variable stars. Other topics will include astronomical photography, spectroscopy, positional astronomy, and electronics for astronomy. Assignments will include some use of the computer, and the observatory's 20-inch reflecting telescope will be used with various instruments. (Offered first semester only.) Note: Satisfies core curriculum science requirement. Prerequisite(s): AT 201 or permission of the instructor. When Offered: Offered every other year in fall.

AT 306—Introductory Astrophysics

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Beginning with a review of basic astronomical concepts and data, this course examines the physics of celestial objects. Topics include stellar atmospheres and interiors, star formation and evolution, pulsating stars, white dwarfs, neutron stars, black holes, the interstellar medium, and structure of our galaxy. Note: Satisfies core curriculum science requirement. Prerequisite(s): PY 161 and AT 201 or permission of the instructor. When Offered: Offered every other year in spring.

AT 308—Cosmology

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A one semester introduction to modern cosmology. Topics include basic fundamental observations of a changing and expanding universe, mathematics describing the expanding universe, dark matter, dark energy, the Cosmic Microwave Background, inflation, nucleosynthesis, and structure formation. Prerequisite(s): MA 124

Biology

Department of Biology

Department Head: Col. Bell

Requirements for major in biology are specified in Biology.

BI 101—General Biology I

Lecture Hours: 3 **Lab Hours:** 3 **Credit Hours:** 4

Lecture material will be derived from the concepts presented in the text. BI 101 will focus upon basic biochemistry and the structure and function of the principle biomolecules; cell structure and function, membrane characteristics and the transport of material across the cell membrane; cell division including the process of fission, mitosis, and meiosis; the structure of DNA and the process of protein synthesis; basic Mendelian and non-Mendelian genetics. Laboratory topics will complement lecture material as well as include use of the scientific method activities as a means of reinforcing lecture material and preparing for an original research project to be conducted at the end of BI 102.

BI 102—General Biology II

Lecture Hours: 3 **Lab Hours:** 3 **Credit Hours:** 4

This course is a continuation of BI 101. Lecture material will be derived from the concepts presented in the text. BI 102 will focus upon evolutionary principles including selection, speciation, phylogeny and homology; ecological principles including population and community dynamics, niche theory, competition, trophic levels and symbiosis; and the structure and functioning of specific organ systems. Laboratory topics will complement lecture material as well as include use of the scientific method activities as a means of reinforcing lecture material and preparing for an original research project to be conducted at the end of the semester.

BI 111—Fundamentals of Biology I

Lecture Hours: 3 **Lab Hours:** 3 **Credit Hours:** 4

This course is the first of a three-part sequence designed to introduce biology majors to the varied topics within the field of biology. BI 111 will cover systematics and biodiversity including cladistics, and the taxonomic groups and phyla survey; evolution including microevolutionary

and macroevolutionary theories; ecology to include competition, speciation, community structure, ecosystems, and biomes. The laboratories will introduce cladistics, present the different phyla, and a semester-long project on ecology.

BI 112—Fundamentals of Biology II

Lecture Hours: 3 **Lab Hours:** 3 **Credit Hours:** 4

This course is the second of a three-part sequence designed to introduce biology majors to the varied topics within the field of biology. BI 112 will focus on organismal biology specifically covering anatomical and physiological systems in plants and animals. The laboratories will include dissection of different specimens as well as a semester-long project on organismal physiology.

BI 113—Fundamentals of Biology III

Lecture Hours: 3 **Lab Hours:** 3 **Credit Hours:** 4

This course is the third of a three-part sequence designed to introduce biology majors to the varied topics within the field of biology. BI 113 will focus on cellular and molecular functioning. Specifically, this course will cover transport across cell membranes, cellular respiration and photosynthesis, DNA structure and functioning of genes, and protein synthesis. The laboratories will include experiments to investigate cell functioning, exercises to investigate DNA structure and modern molecular techniques, and a semester-long project on cell physiology. Prerequisite(s): BI 111 and BI 112 or instructor approval.

BI 192—Independent Research

Lecture Hours: 0 **Lab Hours:** 4-6 **Credit Hours:** 2-3

These courses are for rising third classmen pursuing research during the summer. Permission of instructor and department head required.

BI 193—Independent Research

Lecture Hours: 0 **Lab Hours:** 4-6 **Credit Hours:** 2-3

These courses are for rising third classmen pursuing research during the summer. Permission of instructor and department head required.

BI 204—Physiology

Lecture Hours: 3 **Lab Hours:** 3 **Credit Hours:** 4

The course involves a systematic study of how animals regulate their internal environment and respond and adapt to changes in their external environment. Emphasis will be on mammalian physiology. The laboratory component will stress the assessment of physiologic phenomena through data collection and analysis. Prerequisite(s): BI 101 and BI 102, or BI 111, BI 112, and BI 113.

BI 206—Tropical Marine Biology

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course is an immersive field-oriented experience focused on marine and near-shore ecosystems in the Caribbean, open to all majors. We will spend substantial time snorkeling or surveying a variety of ecosystems, including coral reefs, sea grass beds, mangrove forests, and rock intertidal zones. There will also be opportunity to travel to the mainland of Belize to learn about Mayan culture and history. Students will be required to complete some course work prior to leaving and after returning from the trip. To enroll in the course, you must first apply through the Office of International Programs. Prerequisite(s): BI 101/BI 102 or BI 111/BI 112; and PE 100 or PE 101, or instructor permission (based on a demonstrated basic level of swimming ability).

BI 210—Comparative Animal Nutrition

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

The course addresses basic concepts of nutrition including, nutrient digestion, absorption, and transport, energy balance, diet planning, and vitamin and mineral requirements. Particular attention will be focused on the role of nutrition in the development of chronic disease. Comparisons between humans and other vertebrate animals will highlight the variety of solutions to nutrient usage across species. Prerequisite(s): BI 101, BI 102 or BI 111, BI 112, BI 113

BI 216—Animal Behavior

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A general introduction to the study of animal behavior. Topics to be covered will include: development of behavior, neural and hormonal control of behavior, learning, aggression, and migration. Particular emphasis will be placed on the interpretation of behavior and research methods. Prerequisite(s): BI 101, BI 102, or BI 111, BI 112, and BI 113, or permission of the instructor.

BI 217—General Botany

Lecture Hours: 3 **Lab Hours:** 3 **Credit Hours:** 4

An introduction to the biology of plants. Plant structure and functioning including the anatomy of tissues, physiology, ecology, systematics and the evolution of non-flowering and flowering plants will be presented in the course. The course will emphasize vascular plants with additional coverage of algae and fungi. Prerequisite(s): BI 101 and BI 102, or BI 111, BI 112, and BI 113.

BI 218X—Biology of Gender

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Biology of Gender is designed to provide a general overview of reproduction methods in a variety of living organisms including humans. The course will focus on a number of relevant issues including but not restricted to how the body functions and how male and female health can be affected by social and environmental factors. Topics covered may include anatomy, development, asexual reproduction, general and reproductive health issues, hormone changes throughout life, contraception, pregnancy, STDs, men's and women's health in developing countries and eating disorders, and how humans use biotechnology to manipulate reproduction to produce human pharmaceuticals. Prerequisite(s): No prerequisites. Civilizations and Cultures (X).

BI 219—Conservation Biology

Lecture Hours: 3 **Lab Hours:** 3 **Credit Hours:** 4

This course is an introduction to the principles and modern practice of Conservation Biology. Lectures will be focused on examining the biological implementation and consequences of conservation, wildlife management, and ecosystem processes. Laboratory activities will not only explore the primary literature focused on recent developments in biodiversity studies, but will be focused on the application of population assessment models to biological datasets. Select field trips to local restoration and conservation areas will enhance an understanding of applying these conservation principles to modern global dilemmas. Prerequisite(s): BI 101 and BI 102, or BI 111, BI 112, and BI 113.

BI 222—Environmental Science

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course introduces students to environmental concepts and issues. Topics include ecological communities, land management, forest management, biogeochemical cycles, biodiversity conservation, endangered species, air and water pollution, climate change, nonrenewable energy, renewable energy, energy conservation, and ecological footprints. Prerequisite(s): No prerequisites.

BI 240—Biological Agents in Warfare and Terrorism

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course will cover the types of biological agents that may be used in warfare or employed by terrorists. The effects of these bacteria and viruses have on humans, animals, crop production, and the economy will be discussed. We will begin with a discussion of the use of biological weapons throughout history and the current status of weaponized bacteria and

viruses. We will conclude by covering the future of biological as weapons including manipulation of current pathogens to maximize their destructive threat. Prerequisite(s): No prerequisites.

BI 245X—Epidemics and Society

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course will examine the relationships between devastating disease outbreaks and the evolution of human societies. Classic epidemics such as the "Black Death" of the Middle Ages and the Irish Potato Famine will be analyzed and also compared to modern challenges such as HIV AIDS and Influenza. The course will utilize both text and primary sources to demonstrate the powerful relationship between invisible microbial pathogens and the development of today's political and religious landscape. Prerequisite(s): No prerequisites. Civilizations and Cultures (X).

BI 250—Survey and Analysis of Environmental Issues

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This three-credit course takes a multi-disciplinary approach to explore and analyze the various aspects of environmental issues and problems being faced today and those we are likely to face in the future, on the local, national and international levels. The course will explore how historical, socio-economic, political, biological, engineering and technological forces interact to impact a broad range of issues and potential solutions to the most pressing environmental issues. The course will examine and discuss topics including culture, bio-diversity, species extinction, eco-systems of the oceans and land, and the human impact on the environment including on water, air, land, soils, and climate. Cadets will examine the distribution and intensity of natural disasters and conflict over resources, as well as national defense and military concerns regarding the environment. The course will also explore environmental laws and regulations, market approaches and other means to address these issues.

BI 290/290W—Independent Research

Lecture Hours: 0 **Lab Hours:** 4-6 **Credit Hours:** 1-3

These courses are for third classmen pursuing research during the fall and/or spring semesters. Permission of instructor and department head required. Students pursuing the Writing Intensive (W) option will produce an annotated bibliography and either an introduction or discussion section of a research manuscript. Students pursuing the non-W option will earn Pass/Fail credits for this course.

BI 291/291W—Independent Research

Lecture Hours: 0 **Lab Hours:** 4-6 **Credit Hours:** 1-3

These courses are for third classmen pursuing research during the fall and/or spring semesters. Permission of instructor and department head required. Students pursuing the Writing Intensive (W) option will produce and annotated bibliography and either an introduction or discussion section of a research manuscript. Students pursuing the non-W option will earn Pass/Fail credits for this course.

BI 292/292W—Independent Research

Lecture Hours: 0 **Lab Hours:** 4-6 **Credit Hours:** 2-4

These courses are for rising second classmen pursuing research during the summer. Permission of instructor and department head required. Students pursuing the Writing Intensive (W) option will produce an annotated bibliography and either an introduction or discussion section of a research manuscript. Students pursuing the non-W option will earn Pass/Fail credits for this course. Prerequisite(s): Permission of instructor and department head required. Writing Intensive Course (W).

BI 293/293W—Independent Research

Lecture Hours: 0 **Lab Hours:** 4-6 **Credit Hours:** 2-4

These courses are for rising second classmen pursuing research during the summer. Permission of instructor and department head required. Students pursuing the Writing Intensive (W) option will produce an annotated bibliography and either an introduction or discussion section of a research manuscript. Students pursuing the non-W option will earn Pass/Fail credits for this course. Prerequisite(s): Permission of instructor and department head required. Writing Intensive Course (W).

BI 301—Nematology

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Nematodes are the most abundant and diverse animals on the planet. They are found in terrestrial soil everywhere, from rainforests to deserts to the polar regions, and aquatic sediments from freshwater lakes and streams to intertidal and deep sea marine environments. Many are parasites of our crops, domestic and wild animals, and even humans. This course aims to introduce cadets to nematodes and their amazing diversity of forms and lifestyles, but also to introduce them to broader topics and fields in biology that can be examined through the lens of nematodes. These broader topics include model organisms, ecology, evolution and development. By the end of the course, students should be able to understand and critically examine current research in nematology and incorporate information and skills from other coursework. Prerequisite(s): BI 111, BI 112, & BI 113 or instructor permission.

BI 303—Developmental Biology

Lecture Hours: 3 **Lab Hours:** 3 **Credit Hours:** 4

The normal development of organisms with a comparative description and analysis of the general principles governing growth and development. Laboratory work emphasizes embryology of the frog, chick, and pig. Prerequisite(s): BI 101 and BI 102, or BI 111, BI 112, and BI 113. When Offered: Developmental Biology is offered on an every other year basis.

BI 304—Comparative Vertebrate Morphology

Lecture Hours: 3 **Lab Hours:** 3 **Credit Hours:** 4

This course involves detailed study of the different anatomical systems of the vertebrates. Evolutionary relationships among the groups and functional interpretations of anatomy are stressed. Prerequisite(s): BI 101 and BI 102, or BI 111, BI 112, and BI 113.

BI 306—Histology

Lecture Hours: 3 **Lab Hours:** 3 **Credit Hours:** 4

Histology is the study of anatomy at the tissue level. This course will examine the characteristics of the four basic tissue types and the structure and organization of organ and organ systems. The laboratory portion of the course will emphasize the identification of different tissue types and organs throughout the body based on tissue composition. This course is highly recommended for those students planning on pursuing a career in medicine. Prerequisite(s): BI 101 and BI 102, or BI 111, BI 112, and BI 113. When Offered: Histology is offered on an every other year basis.

BI 307—Vertebrate Biology

Lecture Hours: 3 **Lab Hours:** 3 **Credit Hours:** 4

This course explores the evolutionary origins,diversity, and important aspects of the behavior and ecology of extant vertebrates, including: fish, amphibians, mammals, reptiles and birds. The laboratory portion of the course uses field trips and laboratory exercises to provide hands-on experiences with vertebrates in their natural habitats, with emphasis on species in Virginia. Prerequisite(s): BI 101 and BI 102 or BI 111, BI 112 and BI 113

BI 308—Zoonotic Disease

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Zoonotic diseases are those spread between animals and people. Approximately 60% of all human disease has a zoonotic component and 3 out of 4 emerging infectious diseases has an animal reservoir or vector. This course will focus upon basic diseases transmitted between humans and animals. Comparison between different classes of pathogens (including viruses, bacteria, parasites, fungi etc.) relative to mode of infection, pathogenicity, environment, and disease symptomology will be the basis for tests and all other coursework. Prerequisite(s): BI 111, BI 112, and BI 113 or instructor permission.

BI 310—Evolutionary Biology

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course is an introduction to the principles and processes of evolution, ranging from population biology to global dynamics. We will explore the wide array of obstacles faced by all creatures, the specifics of and unique scenarios in organismal adaptation, as well as the drivers behind those specific adaptations. Topics will include the theory of evolution by natural selection, patterns of speciation, concepts of fitness and adaptation, the genetic and developmental bases of evolution, basics of systematic and phylogeny, macro-evolutionary patterns, large-scale trends in extinctions, and human evolution. Students will explore primary literature in the field and participate in evidence-based group discussions on the biological evidence laying the foundation for evolutionary principles. Prerequisite(s): BI 101 and BI 102, or BI 111, BI 112, and BI 113.

BI 311—Aquatic Ecosystems

Lecture Hours: 3 **Lab Hours:** 3 **Credit Hours:** 4

This course is focused on the biological, chemical, and physical processes driving the interaction and interdependence of organisms in aquatic and marine communities. Lectures will be focused on the application of basic ecological theory and principles to an aquatic habitat, life cycles, and adaptations of organisms important in these systems, and a broad foundation of current issues related to these communities. Laboratory and field-based activities will cover important techniques to collect and analyze information, and a deeper and more practical understanding of the intricacies of local and regional aquatic habitats. Prerequisite(s): BI 101 and BI 102, or BI 111, BI 112, BI 113.

BI 312—Ecology

Lecture Hours: 3 **Lab Hours:** 3 **Credit Hours:** 4

This course focuses on important principles that govern all ecosystems, including how biotic and abiotic factors converge to create natural systems, and how interactions and interdependencies among organisms shape biological communities. Course objectives will be achieved using lectures and a writing assignment that tests a novel hypothesis, using data drawn from peer reviewed scientific literature. The laboratory portion of the course will focus on a semester long ecological experiment. Students will analyze the data and use the results to write a professional-quality scientific paper. Prerequisite(s): BI 101 and BI 102, or BI 111, BI 112, BI 113.

BI 313—Microbiology

Lecture Hours: 3 **Lab Hours:** 3 **Credit Hours:** 4

A survey of the biology of microorganisms encompassing their diversity, structure, metabolism, pathogenesis, and ecology. Laboratory exercises will cover identification and manipulation of bacteria and single-celled eukaryotes. Prerequisite(s): BI 101 and BI 102, or BI 111, BI 112, and BI 113.

BI 321—Invertebrate Zoology

Lecture Hours: 3 **Lab Hours:** 3 **Credit Hours:** 4

The course will cover the general form and function, life histories, ecology and evolution of the major invertebrate phyla. An emphasis will be placed on animals which are representative of their particular group and those that affect the lives of humans. Laboratories will focus on observation of slides and prepared specimens, and dissection of representative organisms. Observation and collection of animals in the field in both freshwater and marine environments will also be required. Prerequisite(s): BI 101 and BI 102, or BI 111, BI 112, and BI 113.

BI 324—Ornithology

Lecture Hours: 3 **Lab Hours:** 3 **Credit Hours:** 4

The course will examine the biology of birds. Lecture topics will include a consideration of the anatomy and physiology of birds, ecology and evolution of birds, and avian behavior with specific emphasis on communication, territoriality, courtship and reproductive behaviors, and migration. The laboratory portion of the course will stress identification of birds in the field. Students will be expected to make visual and auditory identification of local avifauna. Prerequisite(s): BI 101 and BI 102, or BI 111, BI 112, and BI 113; BI 216 highly recommended.

BI 325—Ecological Biochemistry

Lecture Hours: 3 **Lab Hours:** 3 **Credit Hours:** 4

This course explores biochemical and physiological mechanisms mediating ecological interactions between organisms. Topics will include an ecological analysis of predation, competition, and mutualism between plants, microbes, and insects and the underlying carbon metabolism pathways that mediate these interactions. Class lectures prepare students for discussions of primary literature, and a student-lead original research experiment will introduce students to current biochemical and physiological tools to study ecological biochemistry, culminating in an original research report. Prerequisite(s): BI 101 and BI 102, or BI 111, BI 112, and BI 113.

BI 326—Parasitology

Lecture Hours: 3 **Lab Hours:** 3 **Credit Hours:** 4

A survey of Eukaryotic parasites (excluding bacteria and viruses) of humans and other animals. Morphology, classification, pathology, and diagnosis of medically important parasites will be discussed, as will ecological and evolutionary aspects of parasites in human and non-human hosts. Laboratory exercises will include examination of preserved material as well as dissection of invertebrate and small vertebrate hosts to collect, examine, and preserve live parasites. A group research project will be conducted to give cadets experience in developing and testing hypotheses using classical and modern techniques in parasitology as well as data analysis and presentation. Prerequisite(s): BI 101 and BI 102, or BI 111, BI 112, and BI 113.

BI 331WX—Cultural, Ethical, Economic, Religious, and Political issues Surrounding Science and Medicine

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This seminar will address the rapid and almost unmanageable speed of breakthroughs in science and medicine that have tested our abilities to keep up with the many cultural, religious, ethical, political, and economic issues that they evoke. Through a case-based study of actual problems and controversies, we will discuss ways to address these issues as concerned individuals and members of a world culture. Included will be such issues as patients' rights, the use of animals in research, human cloning, stem cell research, screening for human diseases, euthanasia, health care coverage, and access to medical care. Enrollment is restricted by permission of the instructor. Prerequisite(s): No prerequisites. Writing intensive (W) Civilizations and Cultures (X).

BI 335—Neurobiology

Lecture Hours: 3 **Lab Hours:** 3 **Credit Hours:** 4

The course will offer students an in depth understanding of the structure and function of the nervous system, in particular, students will be provided with an overview of comparative and human functional and clinical neuroanatomy in preparation for laboratory sessions involving human and comparative neuroanatomy, conducting original laboratory experiments in the area of developmental neurobiology using live animal models, as well as discussions of clinical case studies. In addition, current scientific papers will be presented dealing with breakthrough discoveries in the areas of brain function. Prerequisite(s): BI 101 and BI 102, or BI 111, BI 112, and BI 113.

BI 340—Teaching Mentorship in Biology

Lecture Hours: 1 **Lab Hours:** 3 **Credit Hours:** 2

Students with at least a 3.0 GPA in their major and who earn an A or a B in a biology course, or by approval of the Department Head, may serve as a teaching assistant for the lab portion of this course in a subsequent semester. The teaching mentee's duties may vary, but a mentee must meet with his/her mentoring professor weekly and attend all laboratory meetings of the course. Student duties will be determined by the course professor and approved by the Department Head. Duties will include: meeting with the professor each week to discuss

teaching strategies and assisting the professor by helping prepare specimens, equipment, quizzes and/or practicals, assisting with teaching the lab or recitations, and creating a new lab or recitation. This is a Pass/Fail course. It may only be taken once and it will not count as a biology elective. Registration for this course requires Department Head approval.

BI 346—Genetics

Lecture Hours: 3 **Lab Hours:** 3 **Credit Hours:** 4

An introductory study in genetics. Emphasis will be placed on understanding the flow of biologic information from DNA to proteins and the mechanisms of genetic change. Students will utilize software to analyze and compare genomes of a variety of organisms in order to better understand change and regulation at the genetic level. Students may not take both BI 205 and BI 346. Prerequisite(s): BI 101 or BI 113.

BI 351—Selected Topics in Biology

Lecture Hours: 2-3 **Lab Hours:** 0-3 **Credit Hours:** 2-4

Selected topics to be discussed by faculty or visiting professors. Topics will be determined upon adequate student interest. When Offered: This course will not necessarily be offered each academic year.

BI 352—Selected Topics in Biology

Lecture Hours: 2-3 **Lab Hours:** 0-3 **Credit Hours:** 2-4

Selected topics to be discussed by faculty or visiting professors. Topics will be determined upon adequate student interest. When Offered: This course will not necessarily be offered each academic year.

BI 353/353W—Summer Scholars Program I

Lecture Hours: 0 **Lab Hours:** 6 **Credit Hours:** 3

The Summer Scholars Program is an intensive research experience. Students selected to participate in the program will conduct independent research under the guidance of a faculty mentor and participate in weekly seminars throughout the summer. Students pursuing the Writing Intensive (W) option will produce an annotated bibliography and either an introduction or discussion section of a research manuscript. Students pursuing the non-W option will earn Pass/Fail credits for this course. Prerequisite(s): Permission of department head, only. Writing Intensive Course (W).

BI 354/354W—Summer Scholars Program II

Lecture Hours: 0 **Lab Hours:** 6 **Credit Hours:** 3

The Summer Scholars Program is an intensive research experience. Students selected to participate in the program will conduct independent research under the guidance of a faculty mentor and participate in weekly seminars throughout the summer. Students pursuing the Writing Intensive (W) option will produce an annotated bibliography and either an introduction or discussion section of a research manuscript. Students pursuing the non-W option will earn Pass/Fail credits for this course. Prerequisite(s): Permission of department head, only. Writing Intensive Course (W)

BI 390/390W—Independent Research

Lecture Hours: 0 **Lab Hours:** 4-8 **Credit Hours:** 1-4

These courses are for second classmen pursuing research during the fall and/or spring semesters. Permission of instructor and department head required. Students pursuing the Writing Intensive (W) option will produce an annotated bibliography and either an introduction or discussion section of a research manuscript. Students pursuing the non-W option will earn Pass/Fail credits for this course.

BI 391/391W—Independent Research

Lecture Hours: 0 **Lab Hours:** 4-8 **Credit Hours:** 1-4

These courses are for second classmen pursuing research during the fall and/or spring semesters. Permission of instructor and department head required. Students pursuing the Writing Intensive (W) option will produce an annotated bibliography and either an introduction or discussion section of a research manuscript. Students pursuing the non-W option will earn Pass/Fail credits for this course.

BI 404—Cell Biology

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An introduction to cell structure and function including: membrane structure and physiology, functions of organelles, nuclear regulation, role of the cytoskeleton, the extracellular matrix, the cell cycle and cell death. Special emphasis is placed on the molecular biology of cellular processes and on current laboratory techniques including PCR and electrophoretic separation of nucleic acids and proteins. Prerequisite(s): BI 101 and BI 102, or BI 111, BI 112, and BI 113.

BI 406—Virology

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Viruses are entities comprised primarily of protein and nucleic acids that infect most life on earth. This course will cover the essentials of virus infection and replication emphasizing biochemical and molecular components essential to virus survival. We will also discuss impacts of viral infection, especially virus/host interactions. These can often lead to debilitating or lethal illness, or economically catastrophic agricultural impacts. Prerequisite(s): BI 111, BI 112, & BI 113 or instructor permission.

BI 411—Immunology

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

The course will focus on the human immune system. Students will first develop an understanding of the varied components of the immune system and then learn how those components interact to efficiently recognize and remove foreign invaders. Regulation of immune responses and immunpathologies will also be discussed. Prerequisite(s): BI 101 and BI 102, or BI 111, BI 112, and BI 113.

BI 420W—Capstone Research Experience

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This is a writing intensive course that is required of all biology majors, culminating in the production of a high-quality senior capstone research paper. The capstone paper will be based on the process of scientific inquiry, involving hypothesis testing based on a cadet's original research or meta-analysis of previously published data. Cadets will also present their work to the Biology Department in the form of a poster. Prerequisite(s): Completion of one of the following courses prior to enrolling: BI 311, BI 312, BI 313, BI 325, BI 326, BI 335, or BI 430. Writing Intensive Course (W).

BI 430—Molecular Biology

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course is designed for upper class cadets who have completed Genetics. Cadets master advanced molecular techniques in a hands-on fashion, exploring molecular biology from its roots in DNA manipulation to modern applications. Through reading and discussing seminal research articles and modern studies, cadets will explore how to use molecular techniques to answer pertinent questions in all fields of biology. Prerequisite(s): BI 101 or BI 113, and BI 205 or BI 346.

BI 490/490W—Independent Research

Lecture Hours: 0 **Lab Hours:** 4-8 **Credit Hours:** 2-4

These courses are for first classmen pursuing research during the fall and/or spring semesters, including majors seeking Institute or Biology Department Honors. Students pursuing the Writing Intensive (W) option will produce an annotated bibliography and either an introduction or discussion section of a research manuscript. Students pursuing the non-W option will earn Pass/Fail credits for this course. Prerequisite(s): Permission of instructor and department head required. Writing Intensive Course (W).

BI 491/491W—Independent Research

Lecture Hours: 0 **Lab Hours:** 4-8 **Credit Hours:** 2-4

These courses are for first classmen pursuing research during the fall and/or spring semesters, including majors seeking Institute or Biology Department Honors. Students pursuing the Writing Intensive (W) option will produce an annotated bibliography and either an introduction or discussion section of a research manuscript. Students pursuing the non-W option will earn Pass/Fail credits for this course. Prerequisite(s): Permission of instructor and department head required. Writing Intensive Course (W).

Business

Department of Economics and Business

Department Head: Col. West

Requirements for a major in economics and business are specified in Economics and Business.

Note: For all economics and business majors, the following courses must be completed with a grade of C or higher: MA 125, MA 126; ERH 101, ERH 102; EC 201, EC 202, EC 300, EC 303, EC 304, EC 330; BU 210, BU 211, BU 220, BU 230, BU 310, BU 316, BU 330, BU 339, BU 440. In addition, a minimum grade point average of at least a C must be earned in all department courses.

BU 210—Financial Accounting

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course covers the basic principles and concepts of accounting, recording and reporting transactions, and preparation and interpretation of financial statements. Emphasis is on the rationale underlying accounting transactions.

BU 211—Managerial Accounting

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course covers (1) GAAP (generally accepted accounting principles) approaches for recording manufacturers' inventory, (2) alternative in-house approaches for evaluating inventory and cost of goods sold, and (3) other analytical approaches to management decision-making, such as budgeting, standard costing and methods for evaluating organizational performance. The focus of the course is on analytical thinking. Prerequisite(s): BU 210 with a grade of C or better.

BU 215—Financial Planning

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A study of the fundamental principles of financial decision making. Overview of money management principles, to include asset management, investment products and planning, personal risk assessment, and insurance. Open to all majors. Note: This course cannot be taken by EC/BU majors or business minors as a business elective. Prerequisite(s): completion of 6 hours of math at VMI or equivalent.

BU 220—Principles of Management

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

The principles and processes of management in the private sector of the economy. Analysis of the managerial functions of planning, organizing, leading, and controlling, emphasizing ethics and social responsibility.

BU 230—Principles of Marketing

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Analysis of the marketing function in business enterprise, including product development, pricing, distribution, and promotion for domestic and global markets. Includes study of market research, environmental scanning and analysis techniques.

BU 305—Intermediate Accounting

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An in-depth study of measurement issues and reporting requirements for assets, together with developing an understanding of the theoretical foundation of financial accounting. The emphasis is on the official pronouncements of the Financial Accounting Standards Board. Prerequisite(s): BU 210 with grade of C or higher.

BU 306—International Business

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This is a course designed to increase the student's awareness of the fundamentals of the international business environment, and focuses on the issues and problems confronting managers in international business. The international business environment includes viewing national differences in political economy and cultures, global trade, monetary policies, strategies and structures of international businesses, and how basic business functions are best performed on an international basis. Prerequisite(s): EC 201, EC 202, BU 220, and BU 230.

BU 310—Business Finance

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

The approach is from the viewpoint of management in making financial decisions for the firm. Business risk and valuation, capital budgeting, cost of capital, and the decision-making process are the four areas emphasized. Prerequisite(s): BU 210 with a grade of C or better.

BU 316—Legal Environment of Business

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

The law as a means to social, political, and economic change. The American legal system from the standpoint of its sources and its philosophy, with special emphasis on business relations and the role of government. The course should develop an understanding of the structural apparatus and techniques of the legal process. Prerequisite(s): EC 201, EC 202, and BU 220 with a minimum grade of C.

BU 320—Business Marketing

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course involves an analysis of the basic principles which govern marketing products and services to organizational customers rather than final consumers who buy goods and services for personal consumption. Attention is focused on the special problems connected with the management of the business marketing organization and the planning, purchase, distribution, promotion, and development of business goods and services. Prerequisite(s): BU 230.

BU 322—Human Resource Management

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

The knowledge, skills, and abilities of management and non-management employees are essential in the attainment of organizational objectives. BU 322 examines the recruitment, selection, training, evaluation, and compensation of employees, within the constraints of

operating efficiency and applicable federal and state laws. Prerequisite(s): BU 220 with a grade of C or higher.

BU 330—Management Information Systems

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An introduction to the field of management information systems, to include basic information systems' concepts, the use of MIS in systematic problem solving, and managerial implications involved with hardware, software, telecommunications, and database management. Prerequisite(s): BU 220.

BU 335—Web 2.0 for Business

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

The purpose of this course is to learn how the internet is changing the way business is done. New technology is making business more efficient, allowing them to increase their customer base, and helping them to improve their profitability. Topics include: social networking, blogging, wikis, collaboration/virtual teams, and media. Prerequisite(s): BU 220 (basic knowledge of business practices is beneficial).

BU 339—Operations Management

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An introduction to operating management decisions which must be made to supply or produce the product or service of an organization. Integrating the major decision responsibilities of process, quality, capacity, and inventory issues through the use of cross-functional decision making is emphasized. Prerequisite(s): BU 220

BU 411W—Equity Markets and Investing

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An introduction to the analysis and valuation techniques used for equity securities. This course will focus on fundamental and technical analysis, market efficiency, the exposition and implementation of valuation techniques, in addition to institutional understanding of securities markets and trading. Note: Writing Intensive Course (W). Prerequisite(s): BU 310, EC 201, & EC 202 with a minimum grade of C.

BU 412—Fixed Income, Derivatives, and Alternative Assets

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course is an introduction to the analysis and valuation techniques used for fixed income securities (mainly bonds), derivative securities (options and futures) and alternative assets (real estate, commodities, etc.) focusing on the concepts and tools that are useful to managers and investors who want to use these securities in a well-diversified portfolio. Prerequisite(s): BU 310, EC 201, & EC 202 with a minimum grade of C.

BU 413—Wealth Management

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Emphasis in the major concepts in the creation and management of wealth for the individual, small privately held firms, and family owned businesses. Analysis of financial and estate planning from a life-cycle perspective; accumulation, preservation, and transfer. Examines the use of insurance as a planning tool for hedging and risk management. Explores the challenge of forecasting, considering both deterministic and random models. Prerequisite(s): BU 310 with a minimum grade of C.

BU 415—Financial Statements Analysis

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A critical analysis of financial statement components. Prerequisite(s): BU 310, EC 201, & EC 202 with a minimum grade of C.

BU 417—Advertising

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course will focus on the visual and communicative side of marketing. It will investigate the multiple roles that marketing research, writing, strategic planning, creativity, and art and design play in marketing communications. Topics include: logo (graphics), branding, retail outlets, packaging (design), brochures (production), public relations, and media based advertising. There will be a team project and numerous term papers. Prerequisite(s): BU 230 with a grade of C or better.

BU 419—International Marketing

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course is designed to provide students with knowledge beyond that of domestic marketing to make practical decisions relevant to entering and competing in foreign markets. The course introduces the main characteristics of international markets and addresses the impact of global environmental factors (economic, social, legal, and cultural) on marketing decisions such as market entry, product development, pricing, promotion, and distribution. Prerequisite(s): BU 230 with a grade of C or better.

BU 420—Marketing Management

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Case studies involving marketing and strategy and policies, concepts and practices. Promotion, pricing and marketing computer simulation. Prerequisite(s): BU 230 with grade of C or higher.

BU 422—Labor and Employment Law

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

While this is a course about the law, it is designed specifically for those who hope to go into management; to provide them with a level of understanding about the labor relations process, the rapidly changing field of employment law, and the rights and responsibilities of employees and employers. Prerequisite(s): BU 220 and BU 316 with a grade of C or higher.

BU 428W—Developing Business Leadership

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

The purpose of this course is to learn how to identify and develop effective leadership, with particular emphasis on business applications. We will identify characteristics of effective leaders, study how leaders apply these characteristics, and strategize on how these characteristics can be developed. Using these characteristics as a foundation, we will examine how they can be used for effective decision-making in different situations and circumstances (e.g. business, sports, military). Note: Writing Intensive Course (W). Prerequisite(s): BU 220 and PS 344.

BU 440—Business Policy Seminar

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A capstone course, dealing with strategy and policy formulation and implementation. It is designed to provide a framework for problem identification, analysis, and decision making: integration and application of accounting, economics, marketing, management, finance, and statistics. Prerequisite(s): BU 210, BU 220, BU 230, BU 310, EC 300 and EC 303. Corequisite(s): EC 304, EC 330, BU 211, BU 316, BU 330, and BU 339.

BU 450—Topics in Business

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Selected topics in business related areas as suggested by members of the faculty and/or cadets. Subject and content to be announced before the semester in which the course is to be taught. Prerequisite(s): Permission of instructor. When Offered: Offered as announced.

BU 451—Topics in Business

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Selected topics in business related areas as suggested by members of the faculty and/or cadets. Subject and content to be announced before the semester in which the course is to be taught. Prerequisite(s): Permission of instructor. When Offered: Offered as announced.

BU 460—Independent Research in Business

Lecture Hours: 0 **Lab Hours:** 2-6 **Credit Hours:** 1-3

Independent research designed for cadets who desire to pursue a research interest in business under the direction of a faculty member. Prerequisite(s): An overall GPA or 2.7 and permission of instructor and department head.

BU 461—Independent Research in Business

Lecture Hours: 0 **Lab Hours:** 2-6 **Credit Hours:** 1-3

Independent research designed for cadets who desire to pursue a research interest in business under the direction of a faculty member. Prerequisite(s): An overall GPA or 2.7 and permission of instructor and department head.

BU 462—Honors Research in Business

Lecture Hours: 2 **Lab Hours:** 0 **Credit Hours:** 2

Designed for cadets pursuing independent research under the direction of a faculty member leading to departmental honors. Prerequisite(s): A 3.2 GPA overall and in all courses in the major. Permission of instructor, department honors committee, and the department head.

BU 463—Honors Research in Business

Lecture Hours: 1 **Lab Hours:** 0 **Credit Hours:** 1

Designed for cadets pursuing independent research under the direction of a faculty member leading to departmental honors. Prerequisite(s): A 3.2 GPA overall and in all courses in the major. Permission of instructor, department honors committee, and the department head.

BU 473—Advanced Topics in Marketing

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course provides more in-depth exposure in several key areas touched upon in Principles of Marketing. The topics will draw from consumer behavior, buyer-seller relations, market research, retail, and brand management. Prerequisite(s): BU 230 with a minimum grade of C.

BU 480—Business Internship

Lecture Hours: 0 **Lab Hours:** 0 **Credit Hours:** 3

Under the supervision of a department faculty adviser, cadets may earn up to three hours of academic credit as a business elective in a summer internship of at least 8 weeks duration in a full-time position. Internships will normally be conducted with a private firm, a governmental agency, or a non-profit organization. Academic credit as a free elective maybe awarded for a second internship, under the provisions specified by the department head. Prerequisite(s): a 2.8 GPA overall and in all business courses, and permission of internship coordinator, the internship faculty adviser, and the department head. Upon the completion of all the academic and employment requirements of the summer internship for credit program, cadets may earn 3 hours of academic credit per summer for either EC 480 and EC 481 or BU 480 and BU 481, although no more than three hours can count towards graduation.

BU 481—Business Internship

Lecture Hours: 0 **Lab Hours:** 0 **Credit Hours:** 3

Under the supervision of a department faculty adviser, cadets may earn up to three hours of academic credit as a business elective in a summer internship of at least 8 weeks duration in a full-time position. Internships will normally be conducted with a private firm, a governmental agency, or a non-profit organization. Academic credit as a free elective maybe awarded for a second internship, under the provisions specified by the department head. Prerequisite(s): a 2.8 GPA overall and in all business courses, and permission of internship coordinator, the internship faculty adviser, and the department head. Upon the completion of all the academic and employment requirements of the summer internship for credit program, cadets may earn 3 hours of academic credit per summer for either EC 480 and EC 481 or BU 480 and BU 481, although no more than three hours can count towards graduation.

Chemistry

Department of Chemistry

Department Head: Col. Stan Smith

Requirements for a major in chemistry are specified in Chemistry.

Prerequisites: Proficiency in CH 131 and CH 132 or in CH 137 and CH 138 for all courses in chemistry numbered 223 or higher. Additional prerequisites are stated in descriptions of courses below.

CH 4XX—Advanced Chemistry Elective

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Please refer to your program evaluation for valid courses which fall into this designation.

CH 111—Laboratory for CH 131

Lecture Hours: 0 **Lab Hours:** 3 **Credit Hours:** 1

A laboratory course designed to reinforce the concepts covered in CH 131. Corequisite(s): CH 131.

CH 112—Laboratory for CH 132

Lecture Hours: 0 **Lab Hours:** 3 **Credit Hours:** 1

A laboratory course designed to reinforce the concepts covered in CH 132. Prerequisite(s): CH 111 and CH 131. Corequisite(s): CH 132.

CH 117—Laboratory for CH 137

Lecture Hours: 0 **Lab Hours:** 3 **Credit Hours:** 1

Experiments designed to demonstrate the basic principles of chemistry with respect to observations, measurements, and calculations. Corequisite(s): CH 137.

CH 118—Laboratory for CH 138

Lecture Hours: 0 **Lab Hours:** 3 **Credit Hours:** 1

A continuation of CH 117. Emphasis is placed upon proper procedures in chemical syntheses and analyses. Prerequisite(s): CH 117 and CH 137. Corequisite(s): CH 138.

CH 125—Laboratory for CH 137

Lecture Hours: 0 **Lab Hours:** 5 **Credit Hours:** 2

Basic directed and guided-inquiry laboratory experiments, including an introduction to the use of laboratory instruments. Some experiments will be project-based, illustrating the nature of modern chemical thought. Corequisite(s): CH 137, for CH majors only*.

CH 126—Laboratory for CH 138

Lecture Hours: 0 **Lab Hours:** 5 **Credit Hours:** 2

A continuation of CH 125, including both qualitative and quantitative analyses. The laboratory will also be an introduction to research philosophies in chemistry. Prerequisite(s): CH 125 and CH 137. Corequisite(s): CH 138, for CH majors only*.

CH 131—Chemical Science I

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Study of the basic principles of chemistry designed for liberal arts majors. Topics include classification of matter, history of the atom, chemical bonding, stoichiometry, acids and bases, and redox. Corequisite(s): CH 111.

CH 132—Chemical Science II

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Continuation of CH 131. Emphasis is on applications of chemical principles to problems including, but not limited to, the economy, the environment, energy sources, and human health. Topics include organic chemistry, natural and artificial polymers, energy sources, and nuclear chemistry. Prerequisite(s): CH 131 or CH 137 and CH 111 or CH 117. Corequisite(s): CH 112.

CH 137—Introductory College Chemistry I

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A study of the fundamental principles of chemistry and their applications, designed for science, math, and engineering majors. Topics include atomic and molecular structure, chemical bonding, gases, thermochemistry, stoichiometry, physical and chemical properties. Corequisite(s): CH 117 or CH 125.

CH 138—Introductory College Chemistry II

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A continuation of CH 137. Topics include solutions, chemical kinetics, chemical equilibrium, ionic equilibrium, thermodynamics, electrochemistry, organic chemistry, descriptive chemistry, and nuclear chemistry. Prerequisite(s): CH 137. Corequisite(s): CH 118 or CH 126.

CH 223—Organic Chemistry I

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Basic studies concerning bonding, structure, and stereochemistry related to the physical and chemical properties of organic compounds, and emphasizing kinetics, thermodynamics and acid-base theory. Synthesis and reactions of alkyl halides, alcohols, alkenes and alkynes are emphasized. Prerequisite(s): CH 138 or its equivalent. Corequisite(s): CH 225 or CH 229

CH 224—Organic Chemistry II

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A continuation of CH 223 with emphasis on the preparation, reactions, and interconversions of organic compounds, stressing synthetic and biochemical aspects as well as modern theoretical and mechanistic approaches. Prerequisite(s): CH 223 with minimum grade of C. Corequisite(s): CH 226 or CH 230

CH 225—Organic Laboratory I

Lecture Hours: 0 **Lab Hours:** 3 **Credit Hours:** 3

For the chemistry major: a companion laboratory for CH 223 emphasizing organic synthesis and laboratory techniques, with additional emphasis on spectroscopy. Corequisite(s): CH 223

CH 226—Organic Laboratory II

Lecture Hours: 0 **Lab Hours:** 3 **Credit Hours:** 3

For the chemistry major: a companion laboratory for CH 224 emphasizing organic synthesis and laboratory techniques, with additional emphasis on spectroscopy. Prerequisite(s): CH 225 Corequisite(s): CH 224

CH 229—Organic Laboratory I for Non-Majors

Lecture Hours: 0 **Lab Hours:** 3 **Credit Hours:** 1.5

A laboratory course serving as traditional companion for Organic Chemistry emphasizing organic synthesis and laboratory techniques. Scientific observation and communication and the use of modern analytical techniques will also be included. Corequisite(s): CH 223.

CH 230—Organic Laboratory II for Non-Majors

Lecture Hours: 0 **Lab Hours:** 3 **Credit Hours:** 1.5

A laboratory course serving as traditional companion for Organic Chemistry that includes mechanistic studies and synthetic problems, and employs instrumental techniques to determine the purity and structure of reaction products. Prerequisite(s): CH 223 minimum grade of C & CH 229 minimum grade of D. Corequisite(s): CH 224

CH 246—Inorganic Chemistry

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

The principle topics for discussion will be atomic structure, molecular structure and bonding, solid structures, acids and bases, molecular symmetry, and coordination chemistry. Prerequisite(s): CH 138 or CH 132

CH 255—Summer Research in Chemistry

Credit Hours: 0

Independent study opportunities, offered in each summer session, for students participating in chemical research under faculty supervision. Prerequisite(s): permission of department head and faculty research adviser.

CH 256—Summer Research in Chemistry

Credit Hours: 0

Independent study opportunities, offered in each summer session, for students participating in chemical research under faculty supervision. Prerequisite(s): permission of department head and faculty research adviser.

CH 262—Public Health issues

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

The course introduces students to the field of public health and its role in their lives and their community. Students will explore a variety of topics including, but not limited to:(1) the mission/goals of public health (2) the role of epidemiology in public health (3) clinical studies and ethical issues; (4) risk factors for disease (5) global nutritional and disease issues (6) food safety, food born diseases and investigating food Bourne outbreaks; (7) cardiovascular diseases, diabetes, and obesity; (8) genetically engineered foods and foods from cloned animals; and (9) body image and eating disorders. Topics can be modified to address other contemporary issues in the field of public health. Prerequisite(s): One of the following: CH 111, CH 117, CH 137, BI 101 or by instructor approval.

CH 301—Physical Chemistry I

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An introduction to gases and chemical thermodynamics. Emphasis is placed on understanding ideal and real gases, distribution functions and the mathematical implications of differential equations to the laws of thermodynamics. Prerequisite(s): MA 124 Corequisite(s): CH 311W

CH 302—Physical Chemistry II

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A continuation of CH 301 with emphasis on chemical kinetics, equilibria, phase equilibria, solutions, electrochemistry, and quantum mechanics. Prerequisite(s): MA 215 or MA 311 and PY 160

CH 311W—Laboratory for CH 301

Lecture Hours: 0 **Lab Hours:** 3 **Credit Hours:** 3

Laboratory exercises which illustrate physical chemistry principles and laboratory techniques. Note: This is a writing intensive course. Corequisite(s): CH 301

CH 312W—Laboratory for CH 302

Lecture Hours: 0 **Lab Hours:** 3 **Credit Hours:** 3

Laboratory exercises which illustrate physical chemistry principles and laboratory techniques. Note: This is a writing intensive course. Corequisite(s): CH 302

CH 321—Structural Biochemistry

Lecture Hours: 0 **Lab Hours:** 0 **Credit Hours:** 3

This will be a two-semester presentation of general biochemistry. In the first semester (BC 321 Structural Biochemistry), each of the major classes of biological molecules will be presented in light of their chemical composition and properties, emphasizing that these molecules obey the fundamental tenets presented in both general chemistry and biology. Structure / function interrelationship will be emphasized. Enzyme kinetics and basic thermodynamics will also be presented. This course also has a laboratory component (BI 323). Prerequisite(s): CH 224. Corequisite(s): CH 323

CH 322—Metabolic Biochemistry

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

The second semester (BC 322 Metabolic Biochemistry) will investigate metabolic pathways as they exist in a variety of organisms. While the metabolism of humans will be emphasized, unique metabolic systems in plant and microbial species will be introduced to demonstrate alternative strategies for energy production and utilization. Prerequisite(s): CH 223

CH 323—Laboratory for CH 321

Lecture Hours: 0 **Lab Hours:** 3 **Credit Hours:** 1.5

Selected experiments involving biochemical principles presented in CH 321. Emphasis will be placed on current analytical and instrumental methods used to separate and identify biologically important compounds. Prerequisite(s): CH 226 or CH 230 Corequisite(s): CH 321

CH 335—Analytical Chemistry I

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Theory and practice of chemical analysis. Classical volumetric methods and an introduction to instrumental methods including potentiometric titrations, spectrophotometry, flame emission and ion selective electrodes. Corequisite(s): CH 337.

CH 336—Analytical Chemistry II

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A continuation of CH 335 with emphasis on more advanced techniques of chemical analysis including gas chromatography, high pressure liquid chromatography, spectroscopy including Fourier Transform Infrared, Nuclear Magnetic Resonance, Fluorescence, atomic absorption and ultraviolet/visible and mass spectrometry. Prerequisite(s): CH 301 and CH 335. Corequisite(s): CH 338.

CH 337—Laboratory for CH 335

Lecture Hours: 0 **Lab Hours:** 3 **Credit Hours:** 3

Laboratory component for CH 335 emphasizing laboratory technique while illustrating analytical principles.

CH 338—Laboratory for CH 336

Lecture Hours: 0 **Lab Hours:** 3 **Credit Hours:** 3

The laboratory component for CH 336 featuring hands-on use of instruments, sample preparation and data interpretation.

CH 355—Summer Research in Chemistry

Credit Hours: 0

Independent study opportunities, offered in each summer session, for students participating in chemical research under faculty supervision. Prerequisite(s): permission of department head and faculty research adviser.

CH 356—Summer Research in Chemistry

Credit Hours: 0

Independent study opportunities, offered in each summer session, for students participating in chemical research under faculty supervision. Prerequisite(s): permission of department head and faculty research adviser.

CH 357—Independent Summer Research

Lecture Hours: 0 **Lab Hours:** 6 **Credit Hours:** 3

Independent research for participants in the VMI Chemistry Department's Summer Research Program. A student working under the supervision of a faculty supervisor, may earn a maximum of three credit hours per summer session. An oral presentation and a comprehensive written research paper are required for each course. Prerequisite(s): permission of department head and faculty research supervisor.

CH 358—Independent Summer Research

Lecture Hours: 0 **Lab Hours:** 6 **Credit Hours:** 3

Independent research for participants in the VMI Chemistry Department's Summer Research Program. A student working under the supervision of a faculty supervisor, may earn a maximum of three credit hours per summer session. An oral presentation and a comprehensive written research paper are required for each course. Prerequisite(s): permission of department head and faculty research supervisor.

CH 359—Research Topics in Chemistry

Lecture Hours: 0 **Lab Hours:** 4 **Credit Hours:** 2

Only qualified junior chemistry students may take this course with the approval of the Chemistry Department head and a research supervisor. Independent research under a faculty mentor.

CH 360—Research Topics in Chemistry

Lecture Hours: 0 **Lab Hours:** 4 **Credit Hours:** 2

Only qualified junior chemistry students may take this course with the approval of the Chemistry Department head and a research supervisor. Independent research under a faculty mentor.

CH 362—Teaching Mentorship in Chemistry

Lecture Hours: 2 **Lab Hours:** 3 **Credit Hours:** 3

Senior students may take this course with the approval of the chemistry department head. Students interested in a teaching career are required to select a professor who will be willing to monitor the student's progress during the course. The student will be required to observe both classes and laboratories which the professor teaches, most likely general chemistry. The student will be required to give short lectures throughout the term in both the recitation and the pre-laboratory classes. The student will also be required to submit sample test questions throughout the semester. Finally, the student will be required to submit a complete syllabus for both a lecture and a laboratory general chemistry course.

CH 396X—Chemistry in A Historical Context

Lecture Hours: 0 **Lab Hours:** 3 **Credit Hours:** 3

This is a course designed to acquaint the student with a historical and cultural context surrounding some of the major chemicals, chemical theories, and discoveries. Using certain themes, i.e. alchemy, medicinal chemistry, conservation of mass and man-made materials, the history and development of chemistry and chemical thought are traced from ancient times to the present. Note: Civilizations & Cultures Course (X). Prerequisite(s): CH 131 or CH 137

CH 401—Advanced Topics in Chemistry

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An in-depth, interdisciplinary exploration of a current area of chemical research coupled with a strengthening of chemistry fundamentals. Required of all 1st Class chemistry majors. This is a Capstone Course.

CH 425—Qualitative Organic Analysis

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

The course is concerned with the theory and practice of systematic identification of organic compounds based on their physical and chemical properties. The application of modern instrumental methods (ir, uv, gc/ms. And nmr spectroscopy) of analysis is discussed. Prerequisite(s): CH 223, CH 224, CH 301, and CH 302.

CH 426—Advanced Organic Chemistry

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Topics covered may include organic reaction mechanisms, stereochemistry of carbon compounds, modern synthetic methods, polymers, and organometallics. The selection of topics is left to the discretion of the instructor. At present, polymer chemistry is the main topic of discussion. Prerequisite(s): CH 223, CH 301, and CH 302.

CH 434—Chemical Synthesis

Lecture Hours: 0 **Lab Hours:** 3 **Credit Hours:** 3

A laboratory course involving the synthesis and characterization of selected inorganic and organic compounds.

CH 444—Advanced Inorganic Chemistry

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

The principal topics for discussion will be coordination chemistry, transition metal chemistry, and organometallic chemistry. Other topics may include bioinorganic chemistry, catalysis, metal cluster chemistry, and physical methods in inorganic chemistry.

CH 451—Senior Thesis

Lecture Hours: 0 **Lab Hours:** 6 **Credit Hours:** 3

Only qualified senior chemistry students may take this course with the approval of the department head. Students are required to select a research project or an advanced phase of some subject in either inorganic, analytical, organic, or physical chemistry, with the approval of the professor in charge of the particular branch of chemistry. Work is performed under the supervision of the professor. (0-6-3 for students taking departmental honors.)

CH 452—Senior Thesis

Lecture Hours: 0 **Lab Hours:** 6 **Credit Hours:** 3

Only qualified senior chemistry students may take this course with the approval of the department head. Students are required to select a research project or an advanced phase of some subject in either inorganic, analytical, organic, or physical chemistry, with the approval of the professor in charge of the particular branch of chemistry. Work is performed under the supervision of the professor. (0-6-3 for students taking departmental honors.)

CH 455—Summer Research in Chemistry

Credit Hours: 0

Independent study opportunities, offered in each summer session, for students participating in chemical research under faculty supervision. Prerequisite(s): permission of department head and faculty research adviser.

CH 456—Summer Research in Chemistry

Credit Hours: 0

Independent study opportunities, offered in each summer session, for students participating in chemical research under faculty supervision. Prerequisite(s): permission of department head and faculty research adviser.

CH 457—Independent Summer Research

Lecture Hours: 0 **Lab Hours:** 6 **Credit Hours:** 3

Independent research for participants in the VMI Chemistry Department's Summer Research Program. A student working under the supervision of a faculty supervisor, may earn a maximum of three credit hours per summer session. An oral presentation and a comprehensive written research paper are required for each course. Prerequisite(s): permission of department head and faculty research supervisor.

CH 458—Independent Summer Research

Lecture Hours: 0 **Lab Hours:** 6 **Credit Hours:** 3

Independent research for participants in the VMI Chemistry Department's Summer Research Program. A student working under the supervision of a faculty supervisor, may earn a maximum of three credit hours per summer session. An oral presentation and a comprehensive written research paper are required for each course. Prerequisite(s): permission of department head and faculty research supervisor.

CH 461—Selected Topics in Chemistry

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Selected areas of chemistry, reflecting the current expertise of the faculty, such as polymer chemistry, the chemistry of amorphous materials, bioorganic chemistry, or the pharmacology of transition metal compounds, will be presented on a year to year basis. Prerequisite(s): The core chemistry courses.

CH 464—Selected Topics in Chemistry

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Selected areas of chemistry, reflecting the current expertise of the faculty, such as polymer chemistry, the chemistry of amorphous materials, bioorganic chemistry, or the pharmacology of transition metal compounds, will be presented on a year to year basis. Prerequisite(s): The core chemistry courses.

CH 466—Polymer Chemistry

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

The course will study the chemical and physical properties of polymers. Cadets will explore a variety of topics including, but not limited to: organic polymers, inorganic polymers, polymer synthesis, polymer characterization, polymer applications, copolymers, molecular weight distributions, crystallinity, morphology, glass transition temperature and plasticizers. It is planned that a final individual project/poster session will be included as part of this course. Topics may be modified to address other contemporary issues in the field of polymer science. Prerequisite(s): Both CH 224 and CH 302 or instructor approval.

CH 467—Theoretical Chemistry

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Concepts in quantum chemistry, molecular symmetry and spectroscopy, statistical thermodynamics, and superconductivity are related to contemporary ideas in physical chemistry. Prerequisite(s): CH 301 and CH 302.

CH 480—Computational Chemistry

Lecture Hours: 2 **Lab Hours:** 0 **Credit Hours:** 2

With the advance of computing power, we can now answer questions that were impossible to solve analytically 40, 50, or even 20 years ago. Computational Chemistry is a short course designed to introduce students to the field of computational chemistry and fundamental quantum mechanical principles utilized therein. In addition to learning the theoretical background of computational chemistry, there will be a practical application portion of the course where students make extensive use of free open-source molecular modeling software obtained online. Students will develop the ability to build and study molecular structures and reactions; the course will introduce cadets to the types of chemical calculations (e.g. methods and basis sets, thermodynamic and kinetic data, transition state structures, reaction coordinate diagrams, molecular orbital surface generation, etc.) can be performed, their strengths and weaknesses, and what information can be obtained as well as introduce them to the jargon of the field. While we will discuss the different levels of calculations (e.g. molecular mechanics, ab initio, correlation interactions, etc.) we will focus on the most heavily utilized algorithm, Density Functional Theory, DFT. Computational problems sets will make up the bulk of the graded assignments and each student will be required to investigate an independent projects tailored to that student. There is no required textbook. Some knowledge of organic compounds and structures is necessary. Prerequisite(s): CH 223

CH 481—Organometallics

Lecture Hours: 1 **Lab Hours:** 0 **Credit Hours:** 1

This short course explores both the fundamental principles for building organometallic compounds and their current utility in the field of catalysis. Prerequisite(s): CH 246.

CH 483—Chemical Agents

Lecture Hours: 1 **Lab Hours:** 0 **Credit Hours:** 1

This is a one credit hour course that will explore the chemistry of chemical agents. The objectives of this course are to understand the roles that chemical structure and physical properties play in the use of these agents. **Note**: This lecture class is not intended to represent any sort of official training (for anything). This is a solely an academic endeavor. There is no lab for this class. Prerequisite(s): CH 223.

CH 486—The Amazing Chemistry of Boron

Lecture Hours: 1 **Lab Hours:** 0 **Credit Hours:** 1

Although all the elements in the first row of the Periodic Table exhibit some differences from the others in the same period, boron seems to be the most amazing in its ability to break the normal rules of bonding and structure. This class will include a study of the commercial uses of boron compounds, synthetic methods, molecular structure, bonding theory, mechanistic principles, medical applications, applications to organic synthesis, and the analytical chemistry of boron compounds using primary literature articles. Prerequisites: CH 246 & CH 335.

Topics:

1. Introduction to Boron
2. Group 13 and the halides
3. Borates
4. Borides
5. Boranes
6. Boron Potpourri
7. Organoborane Chemistry
8. Carboranes
9. etallaboranes

CH 487—Symmetry and Spectroscopy

Lecture Hours: 1 **Lab Hours:** 0 **Credit Hours:** 1

This short course will involve facets of molecular symmetry, group theory, character tables, electronic states and spectra, and Orgel and Tanabe-Sugano Diagrams. Prerequisite(s): CH 246.

CH 488—Industrial Size Chemical Processes

Lecture Hours: 1 **Lab Hours:** 0 **Credit Hours:** 1

This one credit course looks at the role members of society have in practicing their profession. During the next several weeks we shall consider the building blocks of chemical process engineering and assess one or two industrial scale processes. We will determine whether these processes contribute to the viability of a profitable business, to their ability to operate within legal parameters, and to whether society benefits from their existence. During our time together we shall challenge ourselves to recognize our professional obligations. Whether we become chemists, engineers, environmental scientists, or business analysts we all 6 share the burden of travelling life's journey as a responsible citizen of planet earth. Note: Open to all 1st and 2nd classmen.

CH 489—Toxic Elements

Lecture Hours: 1 **Lab Hours:** 0 **Credit Hours:** 1

This is a short course designed to acquaint the student with several of the well-known toxic elements. Their chemistry, environmental impact, analysis, modern and historical uses will be discussed. Prerequisites: CH 246 & CH 335.

Topics:

1. Mercury
2. Arsenic
3. Lead
4. Antimony
5. Thallium

CH 490—Biosynthetic Chemistry

Lecture Hours: 1 **Lab Hours:** 0 **Credit Hours:** 1

This course will examine the pathways that organisms employ to synthesize biological molecules from smaller precursors. The topics of carbon fixation and nitrogen fixation as well as the biosynthesis of carbohydrates, lipids, and amino acids will be covered. The role of potential energy and the mechanisms of some of the key enzymes of these pathways will be covered in detail. Prerequisite(s): CH 223 & CH 224.

CH 491—Introduction to Chemical Ecology

Lecture Hours: 1 **Lab Hours:** 0 **Credit Hours:** 1

There has been great interest in communication among insects and other arthropods to find ways to control them. This course examines the history of the development of chemical ecology, and examples of problems of increasing complexity that have been studied since the late 1950's. Topics covered will include: insect olfaction, pheromone structure, the early pheromone work, classic cases e.g. Cotton Boll weevil and Japanese beetle, complex systems such as bark beetles, arthropod defensive chemistry, volatile elicitors, and others. Prerequisite(s): CH 223 & CH 224

CH 492—Chemical Archeology

Lecture Hours: 1 **Lab Hours:** 0 **Credit Hours:** 1

Within the field of archaeology, chemistry has played a critical role in the reconstruction of humanity's past for over a 150 years. This short course will focus on the application of chromatography, mass spectrometry, and spectroscopy to the elemental, isotopic, and molecular analysis of artifacts and their associated remains including bone, stone, soils, pigments, and organic residues. It will be seen that similar to forensic evidence these remains present numerous analytical challenges when answering questions about composition, chronology, and authenticity. Basic knowledge of organic nomenclature and structure is necessary. Prerequisite(s): CH 138

Chinese

Department of Modern Languages and Cultures

Department Head: Col. Sunnen

All cadets who enter with two or more entrance units in a modern foreign language are given placement tests and are placed in appropriate courses on the basis of the test results combined with their previous high school language coursework, and after consultation with the department head of modern languages.

A single year of a foreign language shall count toward meeting graduation requirements only when the cadet is studying a second language or is taking a language as an elective.

Cadets must demonstrate proficiency in ML 101 in order to be admitted into ML 102. They must, similarly, demonstrate proficiency in ML 102 before enrolling in ML 201, and in ML 201 before enrolling in ML 202/204. Proficiency in ML 202/204 is a prerequisite for admission to 300-level courses. Completion of two 300-level courses or their equivalent is expected before enrollment in any 400—level course. Once a cadet has completed work at the 202/204 level, he/she may not return to the elementary level course for credit.

Cadets who present four years of a high school language or demonstrate native or near-native language abilities may not enroll at the elementary level of that language. Such students will have the choice of enrolling either in the first semester intermediate level of that language or in the first semester elementary course of a different language.

CHI 101—Elementary Chinese I

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An introduction to the fundamentals of Chinese. Primary emphasis on the acquisition of the basic language skills(comprehending, speaking, reading and writing) within the context of civilization and culture. Secondary emphasis on the culture where Chinese is spoken. Intended for beginners with no previous experience in the language.

CHI 102—Elementary Chinese II

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A continuation of CHI 101 . Prerequisite(s): CHI 101

CHI 201—Intermediate Chinese I

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A continuation and systematic review of structural principles and an introduction to the reading and discussion of cultural materials and texts with the aim of improving the four basic language skills. Prerequisite(s): CHI 102

CHI 202—Intermediate Chinese II

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A continuation of CHI 201. This course is intended to consolidate the basic language skills and to prepare the student for advanced work in Chinese. Prerequisite(s): CHI 201

CHI 210—Chinese Martial Arts Cinema

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course explores the history of martial arts film and its unique cinematic aesthetic in Shanghai, Hong Kong, and diaspora communities. Cadets study the related critical issues such as Chinese nationalism, stardom/fandom, gender dynamics, filmmaking, reality/virtuality, and body genre. This course does not include a foreign language component and cannot be used toward a language requirement.

CHI 211X—War and its Legacies in Pre-Modern Chinese Literature

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course examines how the remembrance of war shapes the cultural contours of China. Through materials such as pre-modern Chinese literature about war, students learn about cultural memory and cultural identity. This course does not include a language component and cannot be used to satisfy a language requirement. Note: Civilizations & Cultures Course (X). Prerequisite(s): none.

CHI 220X—20th Century Chinese Popular Culture

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course introduces and compares diverse forms of popular culture from the turn of the twentieth century to the beginning of the 21st. It places popular Chinese culture in a historical and social context, examining the relationship between culture, economy, technology, and politics in China, Hong Kong, and Taiwan. This course does not include a foreign language component and cannot be used toward a language requirement.

CHI 301—Introduction to Advanced Chinese I

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Designed for students who wish to gain a command of spoken and written Chinese. Conducted in Chinese. This is a gateway course that continues to build upon the skills of listening, reading, writing, and understanding. This course is designed to bridge upper-intermediate Chinese to lower-advanced level. Prerequisite(s): CHI 202

CHI 302—Introduction to Advanced Chinese II

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Designed for students who wish to gain a command of spoken and written Chinese. Conducted in Chinese. This is the second part of a gateway course that continues to build upon the skills of listening, reading, writing, and understanding. This course is designed to bridge upper-intermediate Chinese to lower-advanced level. Prerequisite(s): CHI 301

CHI 303—Chinese Composition and Conversation

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course is designed to improve students' spoken and written command of Chinese. Through Integrated Chinese, supplemented by specific reading assignments and discussion topics, students will expand compositional and conversational skills. They will improve speaking and writing through classroom discussions, oral reports, short essays, and exams covering topics in modern Chinese society and culture. Conducted in Chinese. Prerequisite(s): CHI 302.

CHI 304—Great Cities of China: Beijing

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

With a rich history and profound culture, Beijing is the capital and political center of China, and has attracted people of many kinds. This course offers an introduction to the global city Beijing, present and past. Students will explore topics such as spatial symbolism, popular everyday life, art, music and performances in Beijing during different periods, arenas of political rebellions, and the impact of changing economic politics. The course also offers students an opportunity to travel to important historical and cultural sites such as the Great Wall, Tiananmen Square, the Forbidden City, the Mao Mausoleum, 798 Art District, and Beijing

National Stadium (The Bird's Nest). Note: The 304 course will be offered abroad and serves as a companion to the language courses offered in China, so there is no prereq as such.

CHI 305—Business Chinese and Culture

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course provides an introduction to the Chinese language typically used in business settings. It prepares students to the use of Chinese in specific business-related contexts and help them develop a better understanding of China's economy and society. Examples of various topics include business practices (business letters and resumes, job search and interviews), trade and advertising, major Chinese companies/brands, multinational companies, and global market. Students will be exposed to authentic materials such as newspapers and magazines' articles, video clips, and films, and will be guided through a variety of communicative activities in class such as problem-solving tasks, discussion and debate. Prerequisite(s): completion of CHI 202, or the equivalent.

CHI 306—Chinese Theater

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course provides an introduction to Chinese theater from its origin to the present day. Students will learn, through study of seminal texts and video clips of performance, the basics of Chinese theater, including its musical construction, stage presentation, the virtuosity of the actor, role types, costumes, make-up, and so forth. The course is divided into two main parts. In the first part, students read and analyze the plays. In the second part of the course, students will prepare and perform a chosen play. Prerequisite(s): completion of one 300-level course, or the equivalent.

CHI 310—Chinese Strategic Culture

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course examines the intellectual, military and strategic heritage of China through Chinese texts. Study of classical writings such as Sun Tzu's Art of War. Includes theatrical and filmic representations of traditional Chinese strategic culture. Designed for heritage speakers or those with advanced proficiency. Conducted in Chinese. Prerequisite(s): One semester of 300-level Chinese of permission of instructor.

CHI 314—Chinese Civilization

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course offers an introduction to China, present and past. Topics include issues facing China today, including recent political, social, and economic developments, environmental degradation, etc., as well as historical topics such as the imperial state, traditional family values, and the arts. Students will explore meanings in texts and other sources, relating traditional Chinese philosophy, art, literature, statecraft and social thought to their historical contexts and to current events. The course follows a lecture-discussion format and will make use of sources in its original language. Prerequisite(s): CHI 301 and CHI 302.

CHI 421—Introduction to Pre-Modern Chinese Literature and Culture

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course surveys Chinese literature and culture from antiquity up to the early 20th century, covering important works from a wide range of genres such as poetry, fiction, and drama. Beyond close reading of selected literary texts, we will explore the social, economic, and political contexts that establish their cultural significance, and look at their reverberations in contemporary culture. The course follows a lecture-discussion format and will make use of sources in its original language. Prerequisite(s): CHI 302.

CHI 422—Introduction to Chinese Literature and Culture II (after 1900)

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This is an introduction to Chinese Literature in the 20th and 21st century. It investigates modern and contemporary China through a literary lens by which students gain a panoramic overview of Chinese culture, politics, history and society. We will examine the development of modern Chinese literature in a roughly chronological order yet also by major themes that illustrate the literary trends and changes. Both masterpieces and "minor" works are covered in class. The emphasis is placed in fiction, although a variety of genres (poetry, lyric prose, and film) are also discussed. Prerequisite(s): CHI 302.

CHI 450—Capstone in Chinese

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

The cadet will choose a topic incorporating an analysis of historical, literary or cultural factors in China. Hong Kong, Taiwan and Macau as well as Chinese diaspora communities are available topics; field experience and interdisciplinary topics are strongly encouraged. The student will prepare both a research paper and a 20-minute oral presentation. The final paper and the presentation will be in Mandarin. Taught mainly in Chinese. Prerequisite(s): CHI 302 and CHI 303

CHI 455—China Today

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Designed for students who wish to gain an advanced level of modern Chinese. This course covers Chinese social, political, cultural, and economic trends from 1949—present, with emphasis on the period since 1978. Specific topics include Chinese business, international relations, and modern military issues. Cadets will write and revise 600-800 word essays in Chinese on a given topic. Through an intensive writing training and guided revision of response essay, analysis paper, and final topic essay, the student will be able to write in Chinese beyond the sentence level on topics related to daily life and aspects of the Chinese culture. Taught in Chinese. Prerequisite(s): One 300-Level CHI Course.

CHI 481—Survey of Chinese Culture and Society

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A Chinese history and civilization course during the VMI summer abroad program. This course is primarily a culture class designed to educate students on contemporary China through on-site excursions to historical places of interest with a guided tour. May include invited guest lectures by Chinese academics. Topics cover Chinese society such as the educational system, government relations, religion, history, and gender roles in China, among others. This course does not include a foreign language component and cannot be used toward a language requirement.

Civil and Environmental Engineering

Department of Civil and Environmental Engineering

Department Head: Capt. Riester

Requirements for a major in civil engineering are specified in Civil and Environmental Engineering.

CE 109—CE Fundamentals I

Lecture Hours: 1 **Lab Hours:** 2 **Credit Hours:** 2

An introduction to the Civil Engineering profession including its: history, specialty areas, responsibilities, and role in infrastructure. The use of spreadsheets and word processing to present computations and results for design projects. Basic statistics, probability theory, and engineering mechanical drawing.

CE 110—CE Fundamentals II

Lecture Hours: 1 **Lab Hours:** 2 **Credit Hours:** 2

An introduction to computer-aided drafting and design (CADD) with applications to Civil Engineering. Topics will include orthographics, dimensioning, isometrics, and scaling. An introduction to math software for engineering computations and computer programming concepts and structure.

CE 121—Surveying

Lecture Hours: 2 **Lab Hours:** 3 **Credit Hours:** 3

Surveying instruments, measurements of horizontal and vertical distances and direction, traverse computations, topographic mapping, and construction surveys... Corequisite(s): CE 121L

CE 121L—Survey Lab

Lecture Hours: 0 **Lab Hours:** 3 **Credit Hours:** 0

Using various surveying instruments students learn how to measure distances, angles, and elevations to determine plane surveying information. Corequisite(s): CE 121

CE 203—Statics

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Vector and scalar methods in the composition and resolution of forces; moments of forces; equilibrium in two or three dimensions; simple structures including trusses and frames; shear and moment in beams; distributed loads; friction; centroids and centers of gravity. Prerequisite(s): MA 123 with a minimum grade of C.

CE 206—Solid Mechanics

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A study of the behavior of non-rigid bodies when subjected to external tension, compression, bending, torsional loads or a combination of these loads. Development of mathematical expressions that relate to external loads, member properties, and internal stresses, strains, and deflections. Includes elastic and plastic stress theory. Prerequisite(s): MA 124 and CE 203 or ME 201 all with a minimum grade of C.

CE 208X—Introduction to Geographic Information Systems (GIS)

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An introduction to Geographic Information Systems (GIS) including Global Positioning Systems (GPS) as pertinent to past and current practices along with future trends of the 21st Century. The usage of both GIS/GPS is growing exponentially and is applicable to all majors in civilian and military applications. Case histories and software exercises are used to introduce GIS/GPS and the global concepts therein. A variety of information types along with digital maps will be utilized to study historic aspects of American culture in conjunction with basic cultural patterns in other regions of the world. Digital GIS maps allow regional or global trends to be visualized, compared, measured, queried, and analyzed. CE 208X is open to all majors. Note: Civilizations & Cultures Course (X).

CE 250—Survey and Analysis of Environmental Issues

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This three-credit course takes a multi-disciplinary approach to explore and analyze the various aspects of environmental issues and problems being faced today and those we are likely to face in the future, on the local, national and international levels. The course will explore how historical, socio-economic, political, biological, engineering and technological forces interact to impact a broad range of issues and potential solutions to the most pressing environmental issues. The course will examine and discuss topics including culture, bio-diversity, species extinction, eco-systems of the oceans and land, and the human impact on the environment including on water, air, land, soils, and climate. Cadets will examine the distribution and intensity of natural disasters and conflict over resources, as well as national defense and military concerns regarding the environment. The course will also explore environmental laws and regulations, market approaches and other means to address these issues.

CE 301—Structural Theory

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Analysis of statically determinate and indeterminate structures. Application of computers to structural analysis. Prerequisite(s): C or better in CE 206 or ME 206.

CE 302—Civil Engineering Dynamics

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Vector and scalar methods in kinematics, including absolute and relative motion of particles and rigid bodies; kinetics, with solutions of rigid bodies by the methods of force, mass and acceleration, work and energy, and impulse and momentum. Analysis of single degree of freedom systems. Prerequisite(s): CE 203 or ME 201 all with a minimum grade of C.

CE 307—Properties of Engineering Materials

Lecture Hours: 2 **Lab Hours:** 0 **Credit Hours:** 3

A study of mechanical properties of engineering materials with special emphasis on Portland cement concrete. Materials studied include wood, metals (steel and nonferrous metals), plastics, glass, clay, bituminous materials and Portland cement concrete. Materials testing, specifications, and design are examined through both classroom and laboratory work. Prerequisite(s): CE 206 or ME 206 with a minimum grade of C. Corequisite(s): CE 307L

CE 307L—Laboratory for CE 307

Lecture Hours: 0 **Lab Hours:** 3 **Credit Hours:** 0

A laboratory course designed to reinforce the concepts covered in CE 307. Corequisite(s): CE 307

CE 309—Fluid Mechanics

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Elementary mechanics of fluids. Fluid properties; hydrostatics; fluid kinematics; equations of motion; energy equation; momentum principles; flow of liquids and gases in closed

conduits; principles of dimensional analysis and dynamic similitude. Prerequisite(s): MA 124 and CE 203

CE 310—Soil Mechanics

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 4

Origin, nature, and classification of soils; analysis and laboratory tests to determine the engineering and index properties of soils and their application to various design considerations. Prerequisite(s): C or better in CE 206 or ME 206. Corequisite(s): CE 310L

CE 310L—Laboratory for CE 310

Lecture Hours: 0 **Lab Hours:** 3 **Credit Hours:** 0

A laboratory course designed to reinforce the concepts covered in CE 310. Corequisite(s): CE 310

CE 319W—Water Resources Laboratory

Lecture Hours: 0 **Lab Hours:** 2 **Credit Hours:** 1

Laboratory procedures and statistical analysis of experimental data; examination of fluid properties and topics in fluid mechanics and hydrologic and hydraulic engineering; experimental topics in water resources and environmental engineering; and analysis and design of water distribution systems. Prerequisite(s): CE 309 and CE 321. Note: Writing Intensive Course (W)

CE 321—Environmental Engineering

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Environmental engineering aspects of pollution control including a review of environmental chemistry; water/wastewater and industrial waste characteristics; air quality; pertinent environmental regulations; reactor engineering and wastewater treatment; municipal and industrial wastewater treatment plant design; design of air pollution control technologies; and a review of risk assessment.

CE 322—Water Resources Engineering

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Analysis of hydraulic problems associated with the design of civil engineering structures, analysis and design of public water supply systems, and related topics; occurrence and movement of surface water flow including open channel flow and runoff. Prerequisite(s): CE 309

CE 327—Reinforced Concrete Design

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Design of reinforced concrete members by ultimate strength methods. Computer applications. Prerequisite(s): CE 301.

CE 330—Thermodynamics, Heat Transfer, and Electrical Circuits

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Course will cover three areas outside of civil engineering to include thermodynamics, heat transfer, and electrical circuits. Prerequisite(s): PY 160

CE 333—Transportation Engineering

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An overview of highway transportation systems and their relationship to the growth of urban metropolitan areas. The course explores the basic characteristics of highway design and operation and the engineering analysis of highway projects. Prerequisite(s): CE 121.

CE 340X—Environmental Engineering & Construction in Developing Countries

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Environmental Engineering and Construction in Developing Countries uses hands-on application of rudimentary field design and construction techniques for the implementation of basic environmental necessities in developing communities and the enhancement of overall quality of human life. Students conduct construction activities in various developing communities worldwide. The course explores the role of the environmental engineer, and specifically the average human being in worldwide public health and seeks to promote an awareness of communities lacking access to basic human rights such as clean drinking water and adequate sanitation. Students will maintain a daily journal or blog while in-country and will publish the blog or journal on ePortfolio upon return to the U.S. Students are also required to write a preliminary design report for implementation of in-country design, and a final reflective essay to be posted on ePortfolio for dissemination to the general VMI public. Note: Civilizations & Cultures (X)

CE 350—Civil Engineering Project Management

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Introduction of construction management principles for civil engineering projects including project organization and documentation, business organization and legal structure, scheduling (CPM and other) and tracking, cost estimating and cost control, bid preparation, contracts, claims and disputes, labor and OSHA, insurance, and engineering economics. Scheduling and cost estimating use specific applications software and spreadsheets.

CE 401—Hydrology

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Occurrence and movement of surface water including weather and climate; precipitation; evaporation, transpiration, and consumptive use; runoff; infiltration; streamflow; routing; hydrograph analysis; erosions and sedimentation; and urban hydrology. Probability applications to hydrologic data are emphasized. Requires use of spreadsheets and incorporates web-accessible analytical methods and hydrologic data from USGS, US Army Corps of Engineers, SCS, NOAA, and others. Prerequisite(s): CE 322.

CE 402—Structural Mechanics

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Advanced topics in solid mechanics used in fields of structural engineering and in general stress analysis; unsymmetrical bending, shear centers, curved beams, rings, torsion of noncircular cross sections, elastic stability, lateral buckling, and failure criteria. Prerequisite(s): a C or better in CE 301.

CE 403—Foundations

Lecture Hours: 2 **Lab Hours:** 3 **Credit Hours:** 3

Subsurface investigation and the determination of in-situ soil properties. Analysis and design of shallow and deep foundations. Determination of lateral earth pressures and the design of retaining structures. Prerequisite(s): CE 310.

CE 404—Advanced Mechanics of Fluids

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

General analytical relationships in three dimensions using vector analysis. Two-dimensional potential flow theory including the development of continuity, vorticity, irrotationality, stream function, velocity potential, and momentum and energy theorems. Prerequisite(s): CE 309 or permission of the instructor.

CE 405—Wood Engineering

Lecture Hours: 2 **Lab Hours:** 3 **Credit Hours:** 3

This course will provide students with a basic understanding of the production and use of wood as a building material and teach students to analyze, design, and fabricate wood structural elements. The course includes coverage of dimensional lumber, manufactured lumber loads, heavy timber, and the appropriate connection methods. Lab classes are hands on exercises including such topics as sawmill operation, destructive testing of wooden connections, and timber frame fabrication. A semester design project integrates the various course topics into one overall exercise. Prerequisite(s): CE 301.

CE 408—Hydraulic Engineering

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Occurrence and movement of groundwater in porous and fractured soils, and the transport and fate of contaminants released to these soils; design problems for dams, spillways, and gates; analysis of hydraulics problems associated with the design of civil engineering structures. Application of electronic computers. Prerequisite(s): CE 322.

CE 412—Environmental Engineering Chemistry

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Overview of basic physical, equilibrium, biological, and organic chemistry principles and applications for environmental engineering. Emphasis on chemical properties and reactions that influence the characteristics and treatment of wastes and chemically contaminated water, soil, and air.

CE 415—Environmental Engineering Unit Process Design

Lecture Hours: 2 **Lab Hours:** 3 **Credit Hours:** 3

Design and analysis of biological, physical, and chemical processes for treatment of liquid and solid municipal and industrial wastes. Design and analysis of air pollution control technologies. Practical applications are emphasized. Prerequisite(s): CE 321.

CE 416—Fundamentals of Engineering

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An introduction to engineering topics not specifically covered in the CEE curriculum including: dynamics, thermodynamics, electrical theory, and engineering economics. Review of topics deemed required for professional engineering registration. Prerequisite(s): First class standing or permission of instructor.

CE 417X—Infrastructures

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

All organized societies use infrastructures to deliver services essential to the functioning of that society, including food, energy, and water. When these services fail, society begins to disintegrate. This course provides cadets with an understanding of how and why infrastructures function; how societies develop and support infrastructures, and the relationships between infrastructures and the societies they serve. As 21st century societies cannot exist without these complex, inter—and intra-dependent infrastructures, understanding them and their relationship to society is and essential skill for leaders, managers, and citizens. Civilizations & Cultures Course.

CE 418—Air Resources Engineering

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

The objective of this course is to understand the major principles and problems associated with air pollution. We will explore air pollutant effects, sources, and control strategies. After completing this course, you should be able to recognize major legislation governing air pollution, estimate air emissions from different sources, use computer modeling and/or hand calculations to predict pollutant concentrations near an air pollution source, recommend control strategies for specific air pollution problems and clearly present in writing and by presentation proposed solutions to air pollution control problems. Prerequisite(s): CE 321

CE 419—Global Water and Sanitation

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Global Water and Sanitation Design uses hands-on application of rudimentary field design and construction techniques for the implementation of basic environmental necessities in developing communities and the enhancement of overall quality of human life. The course explores the role of the environmental engineer, and specifically the average human being in worldwide public health and seeks to promote an awareness of communities lacking access to basic human rights such as clean drinking water and adequate sanitation. Prerequisite(s): CE 309 & CE 321

CE 423—Structural Steel Design

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Structural steel design: beams, columns, trusses, frames, and connections using design codes and specifications. Prerequisite(s): a C or better in CE 301.

CE 428—Topics in Structural Design

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Analysis and design of structural systems in reinforced concrete, pre-stressed concrete, steel, aluminum, or timber. Computer applications. Prerequisite(s): a C or better in CE 301.

CE 429—Advanced Structural Theory

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Analysis of structures by the matrix force and displacement methods. Use of digital computers in structural analysis. Prerequisite(s): a C or better in CE 301.

CE 436—Transportation Planning and Design

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An overview of the highway transportation modeling process and the relationship of accessibility and urban development highway designs. A special emphasis is placed on intersection planning and design. Field data collecting methods are performed and microscopic transportation modeling packages are utilized to evaluate and analyze intersections. Prerequisite(s): CE 333.

CE 437—Construction Methods and Management

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Applications of civil engineering principles to realistic construction projects using a team approach. Topics include: earth moving operations, dewatering, rock excavation, concrete and asphalt production, concrete formwork design, heavy equipment production, trenchless technology, compressed air systems, construction planning, and safety. Prerequisite(s): CE 350.

CE 443—Independent Research

Lecture Hours: 0 **Lab Hours:** 6 **Credit Hours:** 3

For cadets engaged in research projects under faculty supervision. Prerequisite(s): Permission of department head and faculty research adviser.

CE 448—Civil Engineering Design Capstone

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Application of civil engineering principles to comprehensive engineering problems. Planning and design of realistic projects. Prerequisite(s): First class standing or permission of instructor.

CE 451W—Civil Engineering Seminar

Lecture Hours: 1 **Lab Hours:** 0 **Credit Hours:** 1

Seminars on topics of professional interest. Prerequisite(s): First class standing or permission of instructor. Note: Writing Intensive Course (W)

CE 461—Independent Summer Research

Lecture Hours: 0 **Lab Hours:** 2-6 **Credit Hours:** 1-3

Offered in the summer session to cadets engaged in research projects under faculty supervision. Credits may be substituted for appropriate civil engineering courses offered in the regular session. Prerequisite(s): Permission of department head and faculty research adviser.

CE 470—Topics in Civil Engineering

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Special topics in civil engineering and related areas as suggested by members of the faculty or cadets. Subject and content announced before the semester begins. Prerequisite(s): Permission of instructor. When Offered: Not necessarily offered each year.

CE 471—Topics in Civil Engineering

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Special topics in civil engineering and related areas as suggested by members of the faculty or cadets. Subject and content announced before the semester begins. Prerequisite(s): Permission of instructor. When Offered: Not necessarily offered each year.

Computer and Information Sciences

Department of Computer and Information Sciences

Department Head: Col. Eltoweissy

Requirements for a degree in computer and information sciences are specified in Computer Science, B.S.

CIS 101—Introduction to Computer Science

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course is an introductory survey of the scope of computer and information sciences. This course provides an exposure and a foundation from which cadets can appreciate the relevance and interrelationships of future courses. This course and the text follow a bottom-up arrangement of subjects from the concrete to the abstract. The course begins a discussion of techniques to analyze information needs. Next, we study basics of information encoding and computer architecture, and move on to the study of operating systems and computer networks. After that, we investigate the topics of algorithms, databases, programming, data structures, software development, human computer interaction, and computer graphics. We conclude with a brief overview of the history of information technology. Includes unit on ethics and professionalism in computer science.

CIS 111—Programming I

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An introduction to fundamental data types and programming concepts using a modern algorithmic language. Emphasis is on programming style, documentation, and implementation of standard elementary algorithms and data structures. Note: Course is equated to CS-121 and cannot be taken for additional credit. Corequisite(s): CIS 111L

CIS 111L—Laboratory for Programming I

Lecture Hours: 0 **Lab Hours:** 2 **Credit Hours:** 1

This course provides hands-on practical experience for topics taught in the associated course, CIS 111—Programming I. Cadets will design and implement solutions to several problems and fundamental algorithms discussed in CIS 111 using the Java programming language. Corequisite(s): CIS 111

CIS 112—Programming II

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Program design methods, encapsulation, program maintenance. Run-time behavior and efficiency. Real-time considerations and recovery techniques. Large-scale programming, group management, testing. Language ambiguities and insecurities, subset and superset languages. Note: Course is equated to CS-122 and cannot be taken for additional credit. Prerequisite(s): CIS 111 and CIS 111L with a minimum grade of C. Corequisite(s): CIS 112L

CIS 112L—Laboratory for Programming II

Lecture Hours: 0 **Lab Hours:** 2 **Credit Hours:** 1

This course provides hands-on practical experience for topics taught in the associated course, CIS 112—Programming II. Cadets will design and implement solutions to several problems and fundamental algorithms discussed in CIS 112 using the Java programming language. Prerequisite(s): CIS 111 with a minimum grade of C. Corequisite(s): CIS 112

CIS 131—Introduction to Information Science

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Information systems are an integral part of all business activities and careers. This course is designed to introduce students to contemporary information systems and demonstrate how these systems are used throughout global organizations. The focus of this course will be on the key components of information systems—people, software, hardware, data, and communication technologies, and how these components can be integrated and managed to create competitive advantage. Through the knowledge of how IS provides a competitive advantage students will gain an understanding of how information is used in organizations and how IT enables improvement in quality, speed, and agility. This course also provides an introduction to systems and development concepts, technology acquisition, and various types of application software that have become prevalent or are emerging in modern organizations and society. Note: Course is equated to CIS-253 and cannot be taken for additional credit.

CIS 201—Computer Architecture and Organization

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course aims to provide a foundation for students to understand architecture of computer systems and to apply these insights and principles to computer design. In this course, cadets learn the primary building blocks of computing systems including logical and arithmetic operations, instructions, memory hierarchy, pipelining, interfaces between hardware and software. Upon the understanding of the system architecture, cadets will study the process of system organization. Prerequisite(s): CIS 101, CIS 112, and CIS 112L. Please **Note**: Classes prior to the Class of 2022 are not required to take CIS 112L as a prerequisite.

CIS 211—Internet and Mobile Programming

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A survey of contemporary software tools, languages and techniques for Web application development. Software design, interface design, and use of current technologies in developing client-side and server-side web applications. Technologies include HTML and XHTML, CSS, Development using widely-used scripting languages such as JavaScript and Perl,

and XML / XSL. Note: Course is equated to CIS-311 and cannot be taken for additional credit. Prerequisite(s): CIS 112 and CIS 112L with a minimum grade of C

CIS 231WX—IT:Past, Present, and Future

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Civilization and Cultures course with e-portfolio and reflective essay requirements that allow cadets to explore the science, engineering and origins of information technology and its effects on societies over millennia. Driven by documentary videos, web—based multimedia and small group/full class discussions cadets will be exposed to developments and societal impacts of information technology from early Middle Eastern Civilizations' oral traditions and writing forms to the invention of the 15th century printing press to 19th century railroads, telegraph and telephone to 21st century 3D television, blogs, social networks, and the twenty four hour news cycle. Note: Course is equated to CIS-270WX and cannot be taken for additional credit. Note: Writing Intensive (W) and Civilizations & Cultures Course (X).

CIS 241—Discrete Structures

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course is designed to provide an introduction to discrete mathematics needed by computer science students. Topics covered include number properties, set theory, Boolean algebra, digital circuits, functions and relations, counting, probability, number theory, graph theory, cryptography, and theory of voting. Note: Course is equated to CS-271 and cannot be taken for additional credit. Prerequisite(s): MA 101 & MA 102, or MA 105 & MA 106, or MA 123 & MA 124

CIS 301—Networking

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An intermediate level course discussing the background and history of networking and the Internet, network standards, OSI 7-layer model, TCP/IP, web technologies, and network security. Note: Course is equated to CIS-321 and cannot be taken for additional credit. Prerequisite(s): CIS 201 with a minimum grade of C. Corequisite(s): CIS 301L

CIS 301L—Networking Lab

Lecture Hours: 0 **Lab Hours:** 2 **Credit Hours:** 1

Associated with CIS 301. It focuses on hands-on experimental projects covering the TCP/IP stack from Application to Data Link. Tools like Wireshark, Snort and TCPdump will be used. Experiments with physical routers and other networking devices are also included. Corequisite(s): CIS 301

CIS 302—Modern Operating Systems

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course is designed to provide core concepts of computer architecture and operating systems including Instruction set architectures; Pipelined datapaths; Tradeoffs between performance and cost; Memory hierarchy, memory management, and protection; Processes and threads; CPU scheduling and concurrency control; File system and associated techniques. Note: Course is equated to CIS-405 and cannot be taken for additional credit. Prerequisite(s): CIS 201 and CIS 313 with a minimum grade of C

CIS 303—Computer & Information Security

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course presents a broad overview of the field of computer security. It covers the basic concepts in computer security including software vulnerability analysis and defense, networking and wireless security, applied cryptography, authentication, access control, as well as ethical, legal, social and economic facets of security. The course also explores tools for ethical hacking and intrusion prevention and detection. Students will work in teams to establish closed networks and investigate network attack and defense techniques. Note: Course is equated to CIS-423 and cannot be taken for additional credit. Prerequisite(s): CIS 301 and CIS 301L with a minimum grade of C

CIS 310—Computational Thinking and Programming

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An introduction to programming concepts and fundamental data types in one or more programming languages. Choice of language(s) varies with current software development trends. Note: Course is equated to CS-340 and EE-240 and cannot be taken for additional credit. Note: Not intended for CIS majors or minors.

CIS 312W—Software Engineering

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

The software development process and life cycle: design and implementation, documentation and maintenance, verification and validation, CASE tools, and project management. Social and ethical issues faced by the computing professional. Course includes a collaborative team project with oral and written presentations. Note: Course is equated to CIS-351W and cannot be taken for additional credit. Prerequisite(s): CIS 211 with a minimum grade of C. Note: Writing Intensive Course (W)

CIS 313—Data Structures and Applications

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course is designed to provide individuals with a complete introduction to data Structures and Algorithms concepts. Topics include Object-Oriented Programming, Algorithmic Analysis, Recursion, Array-based Sequences, Stacks, Queues, Deques, Linked Lists, Trees, Priority Queues, Maps, Hash Tables, Skip Lists, Search Trees, Sorting and Selection, Text Processing, Graphic Algorithms, Memory Management, and B-Trees. Note: Course is equated to CIS-415 and cannot be taken for additional credit. Prerequisite(s): CIS 112 and CIS 112L with a minumum grade of C

CIS 322—Database Management Systems

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Introduces database management systems with emphasis on the relational model. Database system architecture, storage structures, access methods, relational model theory, security and integrity, locking, query optimization, and database and retrieval systems design and includes team project experience with a SQL-type relational system. Note: Course is equated to CIS-341 and cannot be taken for additional credit. Prerequisite(s): CIS 112 & CIS 112L with a minimum grade of C

CIS 330—Programming in Languages

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A follow-on course to the CIS 111 and CIS 112 sequence. Practice and projects in coding appropriate problems in various programming languages. Desktop/laptop as well as mobile device projects and various Language exposure varies with modern trends.

CIS 331—Human Computer Interaction

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An introduction to theories and methods for developing and analyzing human-computer interactions. Students will be introduced to the use of graphic, audio, and haptic tools for design and implementation of computer interfaces. The course philosophy is user-centered design. Emphasis is on cognitive factors including information load and learning imposed on users, and modeling user behavior. Application of techniques to both web-based and more traditional user interfaces by implementing a prototype team project. Note: Course is equated to CS-346 and cannot be taken for additional credit. Prerequisite(s): CIS 112, CIS 112L, and CIS 131 with a minimum grade of C Note: This course cannot be taken in conjunction with CS 346.

CIS 342—Data Analytics

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Recently, rapid developments in data collection and storage technologies have led to the generation of many "big" data sets. Data mining has evolved from the disciplines of statistics

and artificial intelligence and is becoming a rapidly growing field to develop techniques for automatic discovery of interesting patterns and relationships in the "big data". This course will provide an introduction to the topic of data mining, and some statistical principles underlying its key methods. Topics covered will include data preprocessing, classification, clustering, dimensionality reduction, association, correlations, and pattern recognition. Students will practice statistical data analysis using R programming language, which is a strongly functional language and environment enabling statistical exploration and graphical displays of data sets. Note: Cannot take if CIS 441 has already been taken. Prerequisite(s): CIS 322—Database Management Systems with a minimum grade of C Note: Cannot take if CIS 441 has already been taken.

CIS 390—Pre-Capstone

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An undergraduate preparation for research experience in CIS under the tutelage of a member of the CIS faculty. Projects are agreed to by cadet and faculty member and culminate with an oral presentation and /paper as determined by the faculty member. This course provides an introduction to CIS research techniques and provides an opportunity to begin the basic review of materials needed to complete the CIS 490 capstone experience. Prerequisite(s): 45 credit hours in the major and Second Class standing.

CIS 401—Advanced Network Security

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Continuation of CIS 303 with emphasis on current attack and defense strategies for systems and the legal framework implemented and proposed for criminalization of system intrusions worldwide and rights management. Note: Course is equated to CIS-426 and cannot be taken for additional credit. Prerequisite(s): CIS 303 with a minimum grade of C

CIS 402—Computer Forensics

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Course introduces the discovery, preservation, and recovery of digital information from electronic devices for executing computer forensics tasks. Included are the hardware, software, technical tools, and legal issues involved with collecting digital data from standalone as well as networked machines used to protect systems, for courtroom evidence presentation, and in crime fighting and anti-terrorist activities. Course discusses basic computer crime legislation and agencies with laboratory exercises emphasizing training for practical use of appropriate software and hardware. Note: Course is equated to CIS-425 and cannot be taken for additional credit. Prerequisite(s): CIS 303 with a minimum grade of C

CIS 411—Web Development

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Continues the web development procedures introduced in CIS 311 . Projects emphasize in depth use of contemporary software tools, languages and techniques for Web application development. Software design, interface design, and use of current technologies in developing client-side and server-side as well as Peer-to-peer web applications.

Prerequisite(s): CIS 311

CIS 412—Mobile Programming

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Continues the web development procedures introduced in CIS 211. Projects emphasize in depth use of contemporary software tools, languages and techniques for mobile application development and mobile operating systems. Software design, interface design, and use of current technologies in developing mobile apps. Note: Course is equated to CIS-413 and cannot be taken for additional credit. Prerequisite(s): CIS 211—Internet and Mobile Programming

CIS 421—Database Design and Development

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course covers SQL queries and database modeling and design emphasizing the relational model. By the end of this course, students will be able to design relational databases by applying fundamentals of database modeling, develop databases based on database designs, and manipulate data using SQL queries. Prerequisite(s): CIS 322—Database Management Systems with a minimum grade of C

CIS 422—Information Retrieval

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course will cover traditional material, as well as recent advances in Information Retrieval (IR), the study of indexing, processing, and querying textual data. Basic retrieval models, algorithms, and IR system implementations will be covered. The course will also address more advanced topics in "intelligent" IR, including Natural Language Processing techniques, and "smart" Web agents. Note: Course is equated to CIS-443 and cannot be taken for additional credit. Prerequisite(s): CIS 322 with a minimum grade of C

CIS 424—Artificial Intelligence

Lecture Hours: 3 **Lab Hours:** 0

Credit Hours: 3

This course is designed to provide individuals with a complete introduction to artificial intelligence concepts. Topics covered include software agent design, informed search, heuristics, adversarial search, constraint satisfaction, inference (logical and probabilistic), knowledge representation, game playing, planning, machine learning, philosophy, and ethics. Prerequisite(s): CIS 313—Data Structures and Applications with a minimum grade of C

CIS 431—Information Organization & Management

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course introduces students to the theory, principles, standards, and methods of information organization. Through lectures, discussions and hands-on practice students learn to provide intellectual and physical access to information objects. Topics covered include information architecture, user information needs and behaviors, tools for information access, principles of information representation, metadata schemas, controlled vocabulary, classification, taxonomy, encoding standards, bibliographic networks, rights management and associated legal infrastructures for privacy protection, applications of technologies in information organization, and design of information systems to facilitate access and retrieval. Note: Course is equated to CIS-355 and cannot be taken for additional credit. Prerequisite(s): CIS 322 with a minimum grade of C

CIS 432—Computer Vision

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Computer vision utilizes computer algorithms to complete visual tasks. The visual tasks include self-driving vehicle navigation, robot navigation, facial recognition, medical imaging analysis, and mechanical, chemical, and biological materials characterization. Visual tasks such as image filtering, image segmentation, recognition, and tracking, image encryption and decryption are interesting and heavily explored in computer vision. Topics to be covered include image filtering and feature description, image segmentation, classification, recognition, and tracking, image deep learning, and image encryption and decryption. Prerequisite(s): CIS 331—Human Computer Interaction with a minimum grade of C

CIS 433—Usability Analysis

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course covers the conceptual frameworks and applied methodologies for user-centered design and user experience research. Emphasis is placed on learning and practicing a variety of usability research methods/techniques such as scenario development, user profiling, tasks analysis, contextual inquiry, card sorting, usability tests, log data analysis, expert inspection and heuristic evaluation. Rather than a Web or interface design course, this is a research

and evaluation course on usability and user experience with the assumption that the results of user and usability research would feed directly into various stages of the interface design cycle. Assignments include usability methods plan, user persona development, scenario and task modeling, card sorting, usability testing project, with talk-along protocols, sense-making scenario creation, and video analysis for product improvement. Prerequisite(s): CIS 331

CIS 434—Bioinformatics

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course will introduce the fundamental theories and practices of Bioinformatics and Computational Biology to the cadets. The course will focus the basic knowledge in the field, methods of high-throughput data generation, accessing public genome-related information and data, and tools for data mining and analysis. Basic concept of probability will also be introduced to help cadets understand the significance of results. Cadets will gain practical experience with bioinformatics tools and develop basic skills in the collection and presentation of bioinformatics data, as well as the basic programming in a scripting language. Prerequisite(s): CIS 342 with a minimum grade of C

CIS 442—Design and Analysis of Algorithms

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course introduces the students to the design and analysis of algorithms. Emphasis is on the efficient design and rigorous analysis of the asymptotic performance of algorithms. Topics covered include algorithm design techniques, sorting techniques, graph algorithms, text processing, and an introduction to the theory of NP-completeness. Prerequisite(s): CIS 313—Data Structures and Applications with a minimum grade of C

CIS 460-469—Independent Study

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Working with a professor, students pursue independent reading, research, and/or technical projects that build on previous coursework in the major.

CIS 490—Capstone

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An undergraduate research experience in CIS under the tutelage of a member of the CIS faculty. Projects are agreed to by cadet and faculty member and culminate with an oral presentation and paper as determined by the faculty member. The paper will normally include a state-of-the-art review of a theoretical or applied problem and an implementation, modification, or enhancement to our current knowledge. Prerequisite(s): CIS 390 with a minimum grade of C

Economics

Department of Economics and Business

Department Head: Col. West

Requirements for a major in economics and business are specified in Economics and Business.

Note: For all economics and business majors, the following courses must be completed with a grade of C or higher: MA 125, MA 126; ERH 101, ERH 102; EC 201, EC 202, EC 300, EC 303, EC 304, EC 330; BU 210, BU 211, BU 220, BU 230, BU 310, BU 316, BU 330, BU 339, BU 440. In addition, a minimum grade point average of at least a C must be earned in all department courses.

EC 201—Principles of Microeconomics

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Principles of Microeconomics is an introduction to the study and critical analysis of the process by which individuals, firms and governments make choices and decisions as they allocate scarce resources. You will learn what a market is, how markets shape the world around us, how they work and how they fail, and how governments can make markets less or more efficient.

EC 202—Principles of Macroeconomics

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

The Principles of Macroeconomics is the analytical study of what makes an economy grow in the short-run and in the long-run. We study the indicators of growth, the factors that determine growth and the role of government in growth.

EC 220X—The Global Economy

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An introduction to issues related to the increasingly global nature of the economy and how globalization impacts countries economically, politically, and culturally. Topics may include: the economic impacts of trade liberalization, foreign direct investment, and global financial investment; the impact of trade on non-economic concerns such as social issues, the environment or politics; and the roles of international institutions such as World Bank, International Monetary Fund, and World Trade Organization. Prerequisite(s): None. Civilization & Cultures (X).

EC 300—Intermediate Microeconomics

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Analysis of consumer behavior, demand, producer behavior, supply, and exchange in markets leading to discussions on the role of market structure in pricing strategies as well as strategic decisions by firms about production, pricing, and investment. This course is calculus based. Prerequisite(s): EC 201-EC 202 and MA 125 & MA 126 (or equivalent) all with grade of C or higher.

EC 303—Statistics

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A study of the basic ideas of descriptive statistics, probability, probability distributions, and statistical inference. Emphasis is placed on the application of statistical theory to economic and business issues. Prerequisite(s): MA 125 and MA 126 (or equivalent) all with grade of C or higher.

EC 304—Econometrics

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A study of the application of economic theory, mathematics, and statistical inference as applied to the analysis of economic phenomena. Heavy emphasis is placed on the use of simple and multiple regression and the violation of the classical assumptions. Prerequisite(s): EC 303 with grade of C or higher.

EC 306—International Economics

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course uses the standard tools of economic analysis. However, since it deals with interaction between sovereign states, it also focuses on government policies and examines their effect. The object of the course is, therefore, to familiarize you with some of the key economic models that can be used to analyze international trade-related and macroeconomic issues. We will examine various theories of trade, welfare implications of different trade policies; the

political economy of trade policies; global trading arrangements, including GATT and WTO; the relationship between trade and various social and political issues. Some questions that we will seek to answer are: Why do countries trade? Why do countries use or abuse trade policy? Is trade always beneficial? We will also discuss exchange rates, different exchange rate regimes and international macroeconomic policy. Note: Free elective for ECBU majors. Prerequisite(s): EC 201-EC 202.

EC 307—International Finance

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course studies the theory and principles of the macroeconomic issues of international economics. In this class, we will investigate how a nation's monetary and fiscal policies are affected by the openness of its economy. The objective of this class is for you to understand, apply and analyze the implications of the following issues for the country's economic well-being: 1) the state of the country's balance of payments, 2) the theory of foreign exchange markets, 3) the different exchange rate policies, and 4) open economy macroeconomic models. Prerequisite(s): EC 201 and EC 202 with a C or higher or permission of instructor.

EC 308—International Trade

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Economic and political interaction among nations has grown tremendously over the last several decades and continues today. Virtually no country can escape the fact that it is part of a larger world community. News reports every day are filled with examples of international trade. Recent examples include: disputes between the World Trade Organization, the imbalance of trade between the U.S. and some of its trade partners and the desire to coordinate macroeconomic policies, the immigration of labor into the U.S. and the international flow of capital, the relocation of production facilities to overseas sites (offshoring), the production of merchandise in low-wage countries, and coordination issues in the European Economic and Monetary Union. The class starts from the positive view that free trade improves the welfare of both trading partners under a restrictive set of assumptions, and proceeds to demonstrate how relaxing those assumptions does not change the basic result. Prerequisite(s): EC 201 and EC 202 with a minimum grade of C. EC 300 is recommended.

EC 313X—The Economics of Transition and Institutional Development of the New EU Member States

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course will explore the role of history, geography, and institutions in the economic development of new European member states in Central and Eastern Europe, with particular emphasis on Slovenia and Hungary. The course will focus on understanding the transition from central planning to market economy, on the accession to the European Union, and on current developments such as the refugee crisis and the 2016 UK referendum on EU membership and its implications for the European Union. Note: Civilizations & Cultures Course (X).

EC 322—Engineering Economy

Lecture Hours: 2 **Lab Hours:** 0 **Credit Hours:** 2

A study of economic analysis for engineering students. Topics include present value, cost (cost-benefit and cost-effectiveness), depreciation, cash flow, break-even, equivalence, and replacement. Note: Credit for EC 322 will not be given to EC/BU majors/minors.

EC 330—Intermediate Macroeconomics

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Intermediate Macroeconomics is the analytical study of the theory of the determination of output, interest rates and inflation in national and global economies. The tools developed in this course are critically applied to the understanding of national economic policy issues. The objective of this class is an understanding of the following: The macroeconomy and measurements of its performance and stability; the theory of aggregate demand, aggregate supply, and macroeconomic equilibrium; the theory of money demand, money supply, interest rates, and the banking system; how the tools of fiscal and monetary policy operate and the factors affecting long-run growth. Prerequisite(s): EC 201-EC 202, and MA 125 and MA 126, (or equivalent) all with a grade of C or higher.

EC 340—Entrepreneurship

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Entrepreneurship is the processes and attitudes that result in organizational innovation, as the confluence of opportunities and ideas. Traditionally, the study of entrepreneurship focused on small and family businesses. However, large organizations have discovered the competitive necessity of flexibility and creativity, functioning as if they were small. EC 340 is integrative and applicative, utilizing concepts from core courses in business and economics. Prerequisite(s): BU 220 or permission of instructor.

EC 401—Developmental Economics

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

The study of the macroeconomic and microeconomic theories relating to issues affecting less developed countries with an emphasis on the role of government and market institutions. Macroeconomics topics may include: income distribution, economic growth, inflation, currencies, and international debt. Microeconomic topics may include: rural-urban migration and wage gaps, unemployment, tenancy, and credit markets. This is a calculus based course. Prerequisite(s): EC 201-EC 202.

EC 403—Public Finance

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Examination of the revenue, expenditure and credit policies and practices of the Federal Government, and of the principles of taxation and fiscal administration. Consideration of selected topics in state and local finance. Prerequisite(s): EC 201-EC 202.

EC 405—Money and Banking

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course describes and analyzes the role of money, commercial banks, nonbank financial institutions, central banks, and financial markets in a modern financial economy. The focus on financial institutions and markets is three-fold, namely 1) fostering real economic activity in the goods and services markets, 2) contributing to the efficiency of the financial economy, and 3) serving as a channel for implementing monetary policy. An international perspective is provided with emphasis on the United States (U.S. dollar) and European Monetary Union (Euro) and their respective monetary frameworks. Prerequisite(s): EC 201-EC 202.

EC 407—U.S. Economic History

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course is the study of the development of the U.S. economy from the colonial period to the present. Emphasis will be placed on the major economic events that have shaped our history. Topics will include the economics of the revolution, westward expansion, slavery, the railroads, the industrial revolution, population growth and urbanization, the rise of big business, the Great Depression, and the intervention of government in the economy. Prerequisite(s): EC 201-EC 202.

EC 408—Development of Economic Thought

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A study of the evolution of economic analysis from the time of Aristotle to the present. Emphasis is placed on how economic theory evolved, how it was influenced by events, and how the early philosophers contributed to its evolution. A comparison with present day orthodox theory is made throughout the course. Prerequisite(s): EC 300 and EC 330 or permission of instructor.

EC 409—Labor Economics

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An economic analysis of the behavior of, and relationship between, employers and employees. Coverage includes both the theoretical and empirical evidence relating to the demand for labor, the supply of labor, the human capital model, labor market discrimination, and special topics such as migration, family economics, and life-cycle aspects of labor supply. Prerequisite(s): EC 300, or permission of instructor.

EC 410—Government and Business

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A study of the development of government control of the private economy; public utility regulation; antitrust legislation and enforcement; the activities of the Federal Trade Commission; and recent steps in the area of consumer information and protection. Prerequisite(s): EC 201-EC 202, or permission of instructor.

EC 411—African Business and Entrepreneurship—Ghana

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course concerns various aspects of the entrepreneurial and international business process such as opportunioity recognition, opportunity evaluation and opportunity modeling. Prerequisite(s): EC 201 is required only for ECBU majors who wish for this to count as an EC Elective. Students not meeting this requirement can still participate in the program but the credits will be for a Free Elective.

EC 412—Managerial Economics

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

The application of economic theory to the decision-making process within a firm and to a wide range of related problems. A pragmatic approach to decision making, using basic economic analyses such as optimizing techniques, cost analysis, capital budgeting, demand estimation, pricing strategies, risk analysis, and production theory. Prerequisite(s): EC 201 and EC 202 with grade of C or higher.

EC 413—Entrepreneurship Practicum

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This overlaps with the first two and involves actual field experiences in terms of identifying and evaluating opportunities and building the appropriate business or marketing models around those opportunities. Cadets will have two main deliverables. The first is a consulting report on a pre-chosen primary project and a second report of a project from the opportunity portfolio built by the cadet while in Ghana. Corequisite(s): HI 401 and EC 411

EC 414—Applied Game Theory

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Learn to analyze sequential and simultaneous games while developing various equilibrium refinements. These concepts are then applied to specific classes of games e.g. the prisoner's dilemma as well as real world applications such as bargaining, brinkmanship, firm strategy, and voting theory. Prerequisite(s): grade of C or better in EC 201 and EC 202 or permission of instructor.

EC 415—Political Economy of Conflict

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course will apply the principles of economics and game theory to understanding the nature of conflict. This understanding will be used to motivate debate about the national security priorities of the US. Prerequisite(s): EC 201 and EC 202 with a grade of C or better.

EC 418—Public Choice

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Public Choice analyses issues in political science and the policy process through the lens of neoclassical economic principles and methodology. Instead of teaching how politics actually works and why. At the core of it, Public Choice analyses the role of government in the economy and the problems of collective decision making. Thematically, issues covered in class include the role and function of government and governmental decision making; the intersection between public and private interests; the connection between voters, politicians, and the economy; and the effect and evolution of governmental institutions. Prerequisite(s): EC 201, EC 202 and EC 303 (minimum grade of C).

EC 420—Behavioral Economics

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Behavioral Economics is a relatively new field in Economics that incorporates social and cognitive psychology into economic thinking and modeling. This field has recently gained attention and momentum as people realized that a better understanding of human behavior can help economists better understand economic choices and processes. Prerequisite(s): EC 300 or permission of instructor.

EC 421—Quantitative Applications in Econ & Business

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Quantitative decision models are an aid to decision makers in economics and in the functional business domains of finance, operations, and marketing. Several quantitative modeling techniques are introduced in this course, including linear programming, nonlinear optimization, decision trees, simulation, and queuing models. Solution techniques using spreadsheets and add-in software are emphasized. Applications to economics include determining optimal pricing and production strategies under uncertainty. Prerequisite(s): BU 339 and BU 310 with a grade of C or better, or permission of instructor.

EC 422—Industrial Organization

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Microeconomics-based theories of transaction costs, game theory, and information theory to explain the structure of firms and markets and their interactions. While the traditional Structure-Conduct-Performance analysis is used as a general framework, the analyses include, but go beyond the idealized markets presented in introductory microeconomics and take a closer look at why firms and markets have evolved into what we observe today. Consider this course an "applied microeconomics" course. Prerequisite(s): EC 300 (completed or concurrent) or permission of instructor.

EC 425—Sports Economics

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course is designed to take an applied look at professional sports as a business. We will focus on empirical issues, while also exploring the theoretical solutions that have been proposed. We will cover topics that range from professional team sports and sports leagues (to include competitive balance issues), the economics of sports broadcasting, player performance and labor relations, public financing for stadiums, and as well as the business dimension of college sports. Prerequisite(s): EC 300 and EC 304

EC 430—Financial Modeling

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An introduction to the concepts, methodologies, and applications of spreadsheet and simulation models in finance. Students will be required to use Excel, and commercial Excel add-in software packages, to design and build financial models for capital budgeting, portfolio allocation, value at-risk, simulation of financial time series, and financial option valuation. Prerequisite(s): BU 310 & BU 339 with a minimum grade of C.

EC 435WX—Institutions and Economic Development

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course will explore the determinants of institutions: how they evolve, and how they affect economic development. Topics include: differences between common law and civil law systems; the significance of a country's colonial origin; the effects of religious beliefs; and the importance of trust in political institutions. Other topics include: the transplantation of formal institutions vs. indigenous institutions; the effects of international aid on economic and institutional development; and the origins of corruption and why it is more prevalent in some cultures than in others. Note: Writing Intensive and Civilizations & Cultures Course Prerequisite(s): EC 201 & EC 202 with EC 304 recommended.

EC 450—Topics in Economics

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Selected topics in economics as suggested by members of the faculty and/or cadets. Subject and content to be announced before the semester in which the course is to be taught. Prerequisite(s): Permission of Instructor. When Offered: Offered as announced.

EC 451—Topics in Economics

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Selected topics in economics as suggested by members of the faculty and/or cadets. Subject and content to be announced before the semester in which the course is to be taught. Prerequisite(s): Permission of Instructor. When Offered: Offered as announced.

EC 460—Independent Research in Economics

Lecture Hours: 0 **Lab Hours:** 2-6 **Credit Hours:** 1-3

Independent research designed for cadets who desire to pursue a research interest in economics under the direction of a faculty member. Prerequisite(s): An overall GPA of 2.7 and permission of instructor and department head.

EC 461—Independent Research in Economics

Lecture Hours: 0 **Lab Hours:** 2-6 **Credit Hours:** 1-3

Independent research designed for cadets who desire to pursue a research interest in economics under the direction of a faculty member. Prerequisite(s): An overall GPA of 2.7 and permission of instructor and department head.

EC 462—Honors Research in Economics

Lecture Hours: 2 **Lab Hours:** 0 **Credit Hours:** 2

Designed for cadets pursuing independent research under the direction of a faculty member leading to departmental honors. Prerequisite(s): A 3.2 GPA overall and in all courses in the major. Permission of instructor, department honors committee, and the department head.

EC 463—Honors Research in Economics

Lecture Hours: 1 **Lab Hours:** 0 **Credit Hours:** 1

Designed for cadets pursuing independent research under the direction of a faculty member leading to departmental honors.

Prerequisite(s): A 3.2 GPA overall and in all courses in the major. Permission of instructor, department honors committee, and the department head.

EC 480—Economics Internship

Lecture Hours: 0 **Lab Hours:** 0 **Credit Hours:** 3

Under the supervision of a department faculty adviser, cadets may earn up to three hours of academic credit as an economics elective in a summer internship of at least 8 weeks duration in a full-time position. Internships will normally be conducted with a private firm, a governmental agency, or a non-profit organization. Academic credit as a free elective may be awarded for a second internship, under the provisions specified by the department head. Note: Upon the completion of all the academic and employment requirements of the summer internship for credit program, cadets may earn 3 hours of academic credit per summer for either EC 480 and EC 481 or BU 480 and BU 481, although no more than three hours can count towards graduation. Prerequisite(s): a 2.8 GPA overall and in all economics courses, and permission of internship coordinator, the internship faculty adviser, and the department head.

EC 481—Economics Internship

Lecture Hours: 0 **Lab Hours:** 0 **Credit Hours:** 3

Under the supervision of a department faculty adviser, cadets may earn up to three hours of academic credit as an economics elective in a summer internship of at least 8 weeks duration in a full-time position. Internships will normally be conducted with a private firm, a governmental agency, or a non-profit organization. Academic credit as a free elective may be awarded for a second internship, under the provisions specified by the department head. Note: Upon the completion of all the academic and employment requirements of the summer internship for credit program, cadets may earn 3 hours of academic credit per summer for either EC 480 and 481 or BU 480 and BU 481, although no more than three hours can count towards graduation. Prerequisite(s): a 2.8 GPA overall and in all economics courses, and permission of internship coordinator, the internship faculty adviser, and the department head.

Electrical and Computer Engineering

Department of Electrical and Computer Engineering

Department Head: Col. Addington

Requirements for a major in electrical and computer engineering are specified in Electrical and Computer Engineering.

EE 110—Introduction to Electrical & Computer Engineering

Lecture Hours: 1 **Lab Hours:** 2 **Credit Hours:** 2

An introduction to the study of the fields of electrical and computer engineering (ECE). Cadets will learn practical skills as applied to the curriculum including problem solving, homework format, laboratory practice, laboratory report formats, project development, and a brief exposure to basic computer tools such as Microsoft Word, Excel, and Visio.

EE 120—Computer Tools in Electrical And Computer Engineering

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Computer Tools is a first semester introduction to designing, building, and analyzing electrical circuits with the aid of Matlab and Spice circuit simulation. Matlab will be used for basic scalar and matrix computations involving circuit behavior, graphical display of circuit variables, and as a programming language. Spice will be used to analyze both static DC operating points and time-varying circuit behavior. Concepts will be reinforced with physical circuits students will design, build, and analyze using lab equipment, Matlab and Spice.

EE 122—DC Circuits

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Electrical Circuit Analysis I, introduces DC resistive circuit analysis with dependent and independent current and voltage sources. Analysis methods include node voltage, mesh current, Thevenin and Norton equivalents, and superposition. Other topics include maximum power transfer, ideal op-amp behavior, and design with opamp building blocks. Familiarity with Matlab and LTSpice is assumed. Note: ECE majors must complete this course with a grade of C or better. Prerequisite(s): MA 123; EE 110 and EE 120, or permission of the instructor.

EE 129—Introduction to Digital Logic Circuits

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Introduction to the fundamentals of combinational and sequential digital logic circuits. Combinational logic topics include number systems and information representations, switching algebra, basic logic gates, and logic circuit minimization. Medium-scale functions such as multiplexers, decoders, and adders are also covered. Sequential logic topics include latches and flip-flops, clocks, timing analysis, and metastability. Combinational logic and flip-flop principles are used in conjunction with state concepts to analyze and synthesize sequential machines. Medium-scale sequential functions such as registers, counters, and shift registers are also covered. Emphasis is placed on the analysis and synthesis procedures used to design combinational and sequential logic systems. Note: ECE majors must complete this course with a grade of C or better. Prerequisite(s): EE 110 and EE 120, or permission of the instructor.

EE 140—C Programming

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An introduction to programming concepts and I/O, standard libraries, and common data structures.

EE 142—C++ & Object Oriented Programming

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Introduction to C++, a language which supports the object oriented programming paradigm. The contributions of data abstraction, encapsulation, inheritance, and polymorphism to the reusability of code and programming in the large. Prerequisite(s): EE 140

EE 221—Discrete Mathematics

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Introduction to discrete mathematics covering logic, sets, functions, algorithmic complexity, basic matrix operations, mathematical reasoning and proof, permutations, combinations, and discrete probability as well as graphs and trees.

EE 223—Electrical Circuit Analysis

Lecture Hours: 3 **Lab Hours:** 2 **Credit Hours:** 4

Electrical Circuit Analysis II, is the second course in a series designed to provide engineering majors the tools to analyze and design passive analog circuits. This course introduces capacitors and inductors, and develops the natural and forced responses of first and second-order circuits containing these elements. It introduces complex phasor notation in the context of sinusoidal steady-state analysis, and then further develops these concepts in the analysis of single and three-phase AC power. The laboratory portion of the course introduces the practical skills of designing, building, and debugging physical circuits in the context of relevant contemporary examples. It includes a major design 4-lab sequence in which cadets design and build a project of their choice. Prerequisite(s): MA 124, C or better in EE 122.

EE 225—Electromagnetic Fields

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Electromagnetic fields is the first of two courses designed to provide the engineer with the tools to analyze electric and magnetic fields. The course explores Maxwell's equations for static systems. Electrostatics: fields in vacuum and material bodies, Coulomb's law, Gauss' law, divergence theorem, Poisson's and Laplace's equations with solutions to elementary boundary value problems. Magnetostatics: fields in vacuum and material bodies, Ampere's law, Biot-Savart's law, Faraday's law, and Stoke's theorem. Prerequisite(s): MA 215.

EE 228—Digital Systems Design

Lecture Hours: 2 **Lab Hours:** 2 **Credit Hours:** 3

Combinational and sequential building blocks are reviewed and used in conjunction with register-transfer language (RTL) and hardware description languages to design complex digital systems. Principles of modularity, hierarchical methods, controller/ datapath partitioning, and a top-down approach are considered in the design process. A hardware description language such as VHDL and programmable logic devices are used in the laboratory to implement digital systems resulting from the aforementioned design process. Prerequisite(s): EE 129 with a minimum grade of C.

EE 230—Signal and System Analysis

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Signals and Systems introduces the Fourier and Laplace transforms as methods to model and analyze continuous-time linear systems (primarily first and second-order circuits) in the frequency domain. Parallels between the time and frequency domains are discussed, and sampling and filter design issues are developed. The course makes extensive use of Matlab as

a computational and visualization tool. In-class labs reinforce theory and develop hardware skills. Prerequisite(s): EE 223 Corequisite(s): MA 311

EE 255—Electronics

Lecture Hours: 2 **Lab Hours:** 2 **Credit Hours:** 3

Electronics is the first of two courses designed to provide the engineer with the tools to analyze a circuit and to design a circuit in which diodes and transistors are major components. Semiconductor theory: doped materials, diodes, bipolar junction transistors, and field-effect transistors. Analysis and design of small-signal single stage amplifiers and digital logic circuits. The laboratory portion will cover diode circuits, BJT/FET biasing schemes, and BJT/FET small-signal amplifier configurations. Prerequisite(s): EE 223.

EE 328—Computer Architecture

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An introduction to the architecture and design of digital computers. Topics include instruction sets and assembly language programming, computer arithmetic, central processing units, pipelines, memory systems, input/output systems, and RISC and CISC concepts. Digital computers are modeled as complex digital systems to which digital systems design methods can be applied. Prerequisite(s): EE 228.

EE 339—Microcontrollers

Lecture Hours: 2 **Lab Hours:** 2 **Credit Hours:** 3

Fundamentals of microprocessors and microcontrollers and their use in embedded systems. Topics include basic architectures, address modes, memory and input/output interfacing, interrupt-driven processing and C programming for embedded systems. Projects involving the use of microcontrollers to solve embedded system design problems such as motor controls, display drivers, analog-to-digital conversion, etc. are integrated in both the laboratory and lectures.

EE 351—Electrical Circuits and Machines

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Analysis of D.C and A.C. electrical circuits. Element equations, Kirchhoff's laws, network theorems, power, phasor techniques, 3-phase systems and transformers; introduction to rotating machines. Prerequisite(s): MA 124. For non-electrical engineering students.

EE 352—Electronic Devices

Lecture Hours: 2 **Lab Hours:** 2 **Credit Hours:** 3

Fundamentals of solid-state devices, amplifier circuits, theory of electronic instruments, sensors, digital interfacing techniques, and an introduction to control systems. Laboratory used to demonstrate principles. Prerequisite(s): EE 351. For non-electrical engineering students.

EE 356—Electronic Applications and Interfacing

Lecture Hours: 2 **Lab Hours:** 2 **Credit Hours:** 3

Electronic Applications and Interfacing is a continuation of EE 255 Electronics. Tools and techniques taught in EE 255 are applied to the design of practical electronic circuits in the course of solving electronics and engineering problems. Operational amplifiers and their characteristics are used to design linear and non-linear circuits to solve analog circuit problems. The Barkhausen criteria are presented for the design of oscillators and waveform generation. Grounding and shielding, power supply decoupling, and the termination of transmission lines to minimize the effects of external and internal noise sources are discussed. Power switching techniques including transistor switches, h-bridges, and pulse-width modulation are used to interface transducers and various types of actuators. Power supply design is studied using linear regulation approaches and introductory switching methods. Digital-to-analog and analog-to-digital conversions are also presented. Circuit simulation software is used throughout the course and typical circuit applications are designed, implemented, and tested in the laboratory. Prerequisite(s): EE 255

EE 372—Electronic Communications

Lecture Hours: 2 **Lab Hours:** 2 **Credit Hours:** 3

Principles of electronic digital communications theory and systems including AM, PAM, and PCM. Fourier analysis techniques are developed and broadly applied both in class and in the supporting laboratory exercises. Various digital modulation techniques such as On-Off Keying, Phase Shift Keying, Frequency Shift Keying, and Quadrature Amplitude Modulation are explored in both the classroom setting and in laboratory exercises. Also included are introductions to: information theory, encoding theory, and noise. Trade-offs among signal power, noise and system bandwidth versus system channel capacity are thoroughly developed. Prerequisite(s): EE 230

EE 376—Project Management

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Project and Program Management is a one-semester three-hour elective course (3-0-3). An electrical and computer engineering project designed by individual students produces functional prototypes and/or software detailed in a final report. A group research project is also conducted which culminates in a 10 page research paper and oral presentation. The research project is comprehensive coving all aspects of project and program management. The course is based on project and program management, planning and control tools to include: 1) Individual Skills 2) Work Breakdown Structure and Work Packages 3) Gantt Chart 4) Cost Accounting and 5) the Systems Engineering Processes.

EE 381—Automatic Control Systems

Lecture Hours: 2 **Lab Hours:** 2 **Credit Hours:** 3

Properties of closed loop (feedback) control systems. Analysis of both analog systems (in open and closed loop configurations) using: transfer functions, and Mason gain techniques. Modeling of electromechanical systems (translational and rotating). System design methods using Bode plots, gain and phase margin. Root locus and designs to meet pole placement and time response specifications are stressed. Knowledge of Laplace transforms and matrix algebra is expected. Prerequisite(s): EE 230, MA 311

EE 400—Optoelectronics

Lecture Hours: 2 **Lab Hours:** 2 **Credit Hours:** 3

This course is comprised of three main sections: the conversion of optical energy to electrical energy; the conversion of electrical energy to optical energy; and the transmission of optical energy. Topics include energy band structures and mechanisms, photoconductors, photoresistors, photodiodes, solar cells, light emitting diodes (LEDs), laser diodes (LDs), fiber optics, and electroluminescence. Laboratory demonstrations involving multiple technologies will complement the lectures throughout the course.

EE 413—Microelectronics

Lecture Hours: 2 **Lab Hours:** 2 **Credit Hours:** 3

This course emphasizes microelectronic circuit design and fabrication, and stresses a familiarization with both established and emerging technologies including: thick/thin films, 3D and multichip modules, nanotechnologies, printed circuit board technologies, surface mount technologies, MEMs/NEMs, optoelectronics, biotechnologies, and advanced electronic materials, packaging, and interconnections. Laboratory experiments involving multiple technologies will complement the lectures throughout the course.

EE 418—Real Time Operating Systems

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Mission-critical computer systems often have real-time constraints, where the system must respond to events within a bounded amount of time (for example, anti-lock brake controllers and fly-by-wire systems). A real-time operating system (RTOS) must support and enable predictable system response time and latency. This course will examine the design of real-time operating systems, including topics such as deadlines, hard vs. soft real time systems,

scheduling algorithms, interrupt handling, inter-task communication and synchronization, and memory allocation.

EE 420—Green Energy Power Conditioning

Lecture Hours: 2 **Lab Hours:** 2 **Credit Hours:** 3

Basic theory and operation of power conditioning required for green energy such as Solar Photo Voltaic (SPV) and wind power are covered. Specifically DC-to-DC converters such as buck, boost, buckboost, and four quadrant power conditioning are investigated. AC-to-DC power conditioning techniques are also covered along with DC-to-AC inverters. Analysis and design of power conditioning systems required for green energy applications which employ some combination of DC-to-DC, AC-to-DC, and DC-to-AC power conditioning is stressed. Prerequisite(s): EE 255.

EE 421X—Systems Design I

Lecture Hours: 2 **Lab Hours:** 2 **Credit Hours:** 3

Part one of a capstone course in the methodologies and attributes of systems design. Topics include: the engineering design process, identification of needs, developing a requirements specification, generating and evaluating concepts, design tools, and professional skills such as teamwork and project management. Particular emphasis is placed on system decomposition, generating behavioral models and testing. Engineering ethics and engineering economy are also represented. Teams of cadets initiate system design based on requirements defined by the IEEE Student Hardware Contest rules. Note: Open to ECE majors only. Civilizations & Cultures Course (X).

EE 426—Semiconductor Devices

Lecture Hours: 2 **Lab Hours:** 2 **Credit Hours:** 3

Topics include: overview of microelectronics fabrication processes; photolithography techniques; oxidation theory, processing and characterization; diffusion theory, processing, and characterization; film deposition techniques; interconnections and contacts in integrated circuits; microelectronic packaging options; and MOS device process integration. The laboratory portion of the course will focus on clean room protocol, and the use of semiconductor processing equipment in the fabrication and characterization of resistors, diodes, and transistors on silicon wafers.

EE 431—Digital Signal Processing

Lecture Hours: 2 **Lab Hours:** 2 **Credit Hours:** 3

Digital Signal Processing discusses the representation of discrete-time signals and systems using time-domain methods such as convolution and frequency-domain methods including the DTFT (Discrete Time Fourier Transform), the DFT (Discrete Fourier Transform), and the Z transform. Other topics include digital filter design and analysis, the impact of sampling in the time and frequency domains, and the design of anti-aliasing and reconstruction filters. The laboratory will emphasize practical considerations involved with the implementation of DSP algorithms. MATLAB will be used for digital signal generation, plotting and the implementation and analysis of DSP operations. Prerequisite(s): EE 230.

EE 435—Fault Tolerant Computing

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course covers techniques for designing and analyzing fault tolerant digital systems. The topics covered include fault models and effects, fault avoidance techniques, hardware redundancy, error detection and correction, time redundancy, software redundancy, combinatorial reliability models. In addition, Markov reliability modeling, Markov availability modeling, safety modeling, design trade-off analysis, and the testing of redundant digital systems will be covered. Prerequisite(s): MA 220.

EE 445—Computer Networks

Lecture Hours: 2 **Lab Hours:** 2 **Credit Hours:** 3

Introduction to computer network fundamentals such as network architecture and Media Access Control (MAC). The topics covered include: ALOHA networks, Carrier Sense Multiple Access (CSMA) networks, CSMA Collision Avoidance (CSMA/CA) networks, CSMA with collision detection (CSMA/CD) networks, token passing networks, Ethernet networks, seven layer OSI model, IEEE network standards, wireless networks to include satellite networks, network media selection, and the fundamental components of the Internet. The ability to design a network to meet a throughput requirement is stressed. Prerequisite(s): MA 220.

EE 450—Biomedical Signal Processing and Biomechanics

Lecture Hours: 2 **Lab Hours:** 2 **Credit Hours:** 3

This laboratory-intensive course is divided into modules covering two of the largest branches of bioengineering: biosignal processing and the mechanical analysis of biostructures. The first module introduces the Short-Time Fourier Transform and its application to speech processing and synthesis. The two-dimensional Z-Transform and its application to filter and enhance medical images are also covered. The second module has a brief treatment of statics and continuum mechanics, then introduces three-dimensional solid modeling techniques, and ties these together with the use of finite element solvers. Prerequisite(s): EE 431.

EE 455—Electrical/Mechanical Design

Lecture Hours: 2 **Lab Hours:** 2 **Credit Hours:** 3

Engineering in practice often employs a hybrid of electrical and mechanical design skills. This laboratory-intensive course takes students already proficient in analog design and microcontroller programming, and in the first module ties these skills together with microcontroller analog interfacing methods. The second module consists of a brief treatment of statics and continuum mechanics, and then introduces three-dimensional solid modeling, additive rapid prototyping, and stress analysis techniques. Students then demonstrate mastery of electrical and mechanical design skills in the third module design project. Laboratory experiments involving microcontroller interfacing and computer-aided design complement the lectures. Prerequisite(s): EE 230, PY 161

EE 460—Portable Power

Lecture Hours: 2 **Lab Hours:** 2 **Credit Hours:** 3

Microelectronics has enabled sophisticated electrically powered communications, sensing/data acquisition, computing, entertainment and positioning systems that are portable. A major challenge is the lifetime, weight, reliability and resupply of the batteries powering these systems. This course examines high-energy-density solutions capable of meeting these enhanced requirements. A laboratory session examines systems efficiencies, energy conversion/storage methods, high efficiency converters/regulators and testing metrics applied as feedback to a systems engineering approach.

EE 469—ECE Internship for Credit

Lecture Hours: 0-3 **Lab Hours:** 0 **Credit Hours:** 0-3

Designed for students pursuing an internship for credit in ECE. Students must meet eligibility, registration, and documentation requirements, as outlined in the VMI Academic Regulations.

EE 471W—System Design Validation

Lecture Hours: 2 **Lab Hours:** 2 **Credit Hours:** 3

Part two of a capstone course in the methodologies and attributes of systems design. The objective of this course is to complete and validate a system design satisfying requirements defined by the IEEE Student Hardware Contest rules through a final evaluation occurring as a multi-team competition. This course applies test and evaluation as feedback to conceptual, logical and physical design steps of multiple subsystems and the integrated system. Once implemented and tested, the system design is explored in a formal oral presentation to the faculty accompanied by a formal written report. A reflective essay addresses lessons learned

from application of a complex systems engineering process that produces both a product and management processes. Note: Writing Intensive Course (W) Prerequisite(s): EE 421X

EE 473—Selected Topics in Electrical and Computer Engineering

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Special topics in electrical and computer engineering as suggested by members of the faculty or cadets. Subject and content announced before the semester begins. Topics will be determined upon adequate student interest. Prerequisite(s): Permission of the Instructor.

EE 474—Selected Topics in Electrical and Computer Engineering

Lecture Hours: 2 **Lab Hours:** 2 **Credit Hours:** 3

Special topics in electrical and computer engineering as suggested by members of the faculty or cadets. Subject and content announced before the semester begins. Topics will be determined upon adequate student interest. Prerequisite(s): Permission of the Instructor.

EE 491-496—Undergraduate Research in ECE

Lecture Hours: 0-1 **Lab Hours:** 0-6 **Credit Hours:** 1-3

Designed for students pursuing undergraduate research under the supervision of one or more members of the ECE faculty. Approval of the instructor(s) and the ECE Department Head is required. A final paper and/or presentation will be required at the end of the course, as deemed appropriate by the instructor(s).

English, Rhetoric, and Humanistic Studies

Department of English, Rhetoric, and Humanistic Studies

Department Head: Col. Miller

Requirements for a major in English are specified in English, Rhetoric, and Humanistic Studies.

Note: A minimum grade of C in ERH 101 , WR 101, or EN 101 is a prerequisite for ERH 102 , and a minimum grade of C in ERH 102 , WR 102, or EN 102 is a prerequisite for all 200—and 300-level English, Rhetoric, and Humanistic Studies courses. All 400-level courses have additional prerequisites, which are listed in the course descriptions or provided in registration materials. These prerequisites may be waived by the department head if there is evidence that the cadet is well prepared for the 400-level course.

200-level courses: These courses build on research-informed writing skills developed in ERH 102—Writing and Rhetoric II. Major writing assignments are typically 1000 words each, totaling at least 2000 words, and emphasizing close reading, synthesis of ideas, and guided use of sources.

300-level courses: Intermediate courses stressing critical reading of more complex works and research-informed writing. Major writing assignments are typically 1500 words each, totaling at least 3000 words, and emphasizing analysis. Assignments require cadets to demonstrate some originality of thought.

400-level courses: Advanced courses requiring more independent work, substantial reading assignments, writing totaling 4000 words, and typically a major course project.

ERH 101—Writing and Rhetoric I

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course introduces the essential principles of rhetoric, develops cadets' ability to analyze complex texts rhetorically, and refines their writing strategies, paying special attention to their critical reflection on their writing processes. Such essential practices as invention, arrangement, and revision will be emphasized in their writing of expository essays. Minimum grade of C required. Cadets cannot take this course if they have already taken WR 101.

ERH 102—Writing and Rhetoric II

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course engages cadets in reading, thinking, and writing about contemporary civic issues from a rhetorical perspective. Cadets learn to write persuasive essays for public audiences in which they ethically incorporate research from appropriate secondary sources, as well as to critically reflect on their writing processes. Minimum grade of C required. Cadets cannot take this course if they have already taken WR 102 or EN 102. Prerequisite(s): ERH 101, WR 101, or EN 101, with a minimum grade of C.

ERH 103—Fundamentals of Public Speaking

Lecture Hours: 1 **Lab Hours:** 0 **Credit Hours:** 1

Emphasizing organization and delivery, this course introduces basic rhetorical theory and teaches cadets to consider audience, purpose, context, and occasion as both speakers and listeners. While there are no prerequisites, cadets are encouraged to complete ERH 102 with a minimum grade of C prior to taking ERH 103. Cadets cannot take this course if they have already taken SE 300.

ERH 201—Rhetorical Traditions I

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An introduction to the early history of rhetoric, from the ancient Greeks to the Renaissance. Emphasis is placed on defining rhetoric and the ways in which ethical, religious, political, economic, and cultural beliefs and values shape its traditions, terms, and realms of influence. Cadets cannot take this course if they have already taken WR 230 or WR 230W. Prerequisite(s): ERH 102, WR 102, or EN 102, with a minimum grade of C.

ERH 202—Rhetorical Traditions II

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A study of the development of rhetoric from the Enlightenment through postmodernism. Emphasis is placed on defining rhetoric and the role it plays in everyday arguments, paying particular attention to the conditions—political, economic, and cultural—that influence acts of communication through language. Prerequisite(s): ERH 102, WR 102, or EN 102, with a minimum grade of C.

ERH 203—Ways of Reading

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A research-oriented introduction to theoretical frameworks for reading and analyzing texts as cultural products, with an emphasis on interpreting the relationship between context and meaning. Cadets cannot take this course if they have already taken EN 250 or EN 250W. Prerequisite(s): ERH 102, EN 102, or WR 102, with a minimum grade of C.

ERH 204—The Language of Art

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An introduction to the visual arts both in theory and in practice. Cadets will learn about formal elements, context, content, and interpretation of art as well as experiment with various media in the studio. They will develop visual perception—that is, the ability to "read" aesthetic and intuitive aspects of art and architecture, or the overall language of art. Cadets cannot take this course if they have already taken FA 207. Prerequisite(s): ERH 102, WR 102, or EN 102, with a minimum grade of C.

ERH 205—British Literary Traditions

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An introduction to British literary movements focusing on major texts that illustrate how writers have shaped and been shaped by traditions and cultures. Cadets cannot take this course if they have already taken EN 201, EN 201W, EN 202, or EN 202W. Prerequisite(s): ERH 102, WR 102, or EN 102, with a minimum grade of C.

ERH 206—American Literary Traditions

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An introduction to American literary movements by focusing on major texts that illustrate how writers have shaped and been shaped by traditions and cultures. Cadets cannot take this course if they have already taken EN 209. Prerequisite(s): ERH 102, WR 102, or EN 102, with a minimum grade of C.

ERH 207—Ethics

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An introduction to critical thinking about moral concepts and issues, including why one should be moral, major theories of what is right and wrong, and controversial social problems concerning questions of justice, life, and death. Cadets cannot take this course if they have already taken PH-204 or PH-304. Prerequisite(s): ERH 102, WR 102, or EN 102, with a minimum grade of C.

ERH 211—Comparative Religion

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An introductory survey of the major religious traditions of the world, noting similarities and differences between them. Particular attention is paid to the relation between religion and culture. Cadets cannot take this course if they have already taken PH 307. Prerequisite(s): ERH 102, WR 102, or EN 102, with a minimum grade of C.

ERH 212—Ancient Greek and Medieval Philosophy

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An introduction to some of the main concepts and arguments developed by philosophers from before the birth of Socrates to the end of the Middle Ages. Questions to be explored might include: What is the fundamental nature of reality? What is the nature of human beings? What and how can we know about such things? Cadets cannot take this course if they have already taken PH 201. Prerequisite(s): ERH 102, WR 102, or EN 102, with a minimum grade of C.

ERH 213—Modern and Contemporary Philosophy

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An introduction to some of the main concepts and arguments developed by Western philosophers since the Renaissance, and contemporary responses to them. Questions to be explored might include: Can we ever really know anything about the world outside our own minds? Can we prove that God exists? How can a physical body be conscious? Cadets cannot take this course if they have already taken PH 202. Prerequisite(s): ERH 102, WR 102, or EN 102, with a minimum grade of C.

ERH 214—Introduction to Music

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A survey of major styles of music, including brief study of the fundamentals of theory and notation. The course will emphasize both the physical and cultural conditions that shaped each style—e.g., religion, geography, social customs, patronage, architecture, instrument-design—and its products. Cadets cannot take this course if they have already taken FA 340. Prerequisite(s): ERH 102, WR 102, or EN 102, with a minimum grade of C.

ERH 215—History of Art I

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A foundational study of the arts of sculpture, architecture, painting, drawing, and craft traditions from the Prehistoric period through the Medieval era and from many cultures. The course develops awareness of the importance of the arts as an expression of human endeavor and the intimate connection between art and various social, political, philosophical, and religious movements. Cadets cannot take this course if they have already taken FA 251. Prerequisite(s): ERH 102, WR 102, or EN 102, with a minimum grade of C.

ERH 216—History of Art II

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A foundational study of the arts of sculpture, architecture, painting, drawing, and craft traditions from the Renaissance through the Modern era and from many cultures. The course develops awareness of the importance of the arts as an expression of human endeavor and the intimate connection between art and various social, political, philosophical, and religious movements. Cadets cannot take this course if they have already taken FA 252. Prerequisite(s): ERH 102, WR 102, or EN 102, with a minimum grade of C.

ERH 217—Film and Performance Studies

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A study of the history and aesthetics of film establishing a foundation for understanding and evaluating film as an art form. The course will offer cadets the opportunity to engage critically with visual texts by addressing cinematic reading strategies and textual analysis. Cadets cannot take this course if they have already taken FA 346. Prerequisite(s): ERH 102, WR 102, or EN 102, with a minimum grade of C.

ERH 221—Digital Rhetorics

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An introduction to navigating, analyzing, and participating in networked writing spaces, as well as developing projects using images, audio, video, and words. Attention will be given to defining digital literacy—its language, modes of thought, and methods of communicating complex meaning—within the historical framework of rhetorical traditions. Projects with practical application for external audiences will be emphasized. Prerequisite(s): ERH 102, WR 102, or EN 102, with a minimum grade of C.

ERH 222—Genre Studies—Poetry

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A study of the conventions of poetry with opportunities to practice writing in the genre. The course emphasizes the process and techniques of original composition and includes opportunities to share work beyond the classroom. Cadets cannot take this course if they have already taken WR 332 or WR 332W. Prerequisite(s): ERH 102, WR 102, or EN 102, with a minimum grade of C.

ERH 223—Genre Studies—Fiction

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A study of the conventions of fiction with opportunities to practice writing in the genre. The course emphasizes the process and techniques of original composition and includes opportunities to share work beyond the classroom. Cadets cannot take this course if they have

already taken WR 330 or WR 330W. Prerequisite(s): ERH 102, WR 102, or EN 102, with a minimum grade of C.

ERH 224—Genre Studies—Nonfiction

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A study of the conventions of non-fiction with opportunities to practice writing in the genre. The course emphasizes the process and techniques of original composition and includes opportunities to share work beyond the classroom. Cadets cannot take this course if they have already taken WR 334 or WR 334W. Prerequisite(s): ERH 102, WR 102, or EN 102, with a minimum grade C.

ERH 225—Visual Arts Studio

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A study of the conventions of one or more of the visual arts—e.g., painting, drawing, photography, film, and computer media—with opportunities to practice in the medium. The course emphasizes original creative expression and includes opportunities to share work beyond the classroom. Prerequisite(s): ERH 102, WR 102, or EN 102, with a minimum grade of C.

ERH 230—Artistic Responses to Social and Political Issues

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A study of the ways in which artists in the fine arts, literature, and/or music have responded creatively to social and political issues. The course may focus on a single genre or issue, or it may take a broader view. Prerequisite(s): ERH 102, WR 102, or EN 102, with a minimum grade of C.

ERH 240—Poverty and Human Capability

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An exploration of the causes of, and possible solutions to, the problem of poverty, especially within the United States. Cadets will study various ways of understanding and defining poverty, as well as the question of whose moral responsibility it is to do something to alleviate poverty. The goal is not only to develop a greater understanding of poverty and the poor, but also to identify solutions that are both practical and ethical. Cadets cannot take this course if they have already taken PH 303. Prerequisite(s): ERH 102, WR 102, or EN 102, with a minimum grade of C.

ERH 250—Teaching Writing

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An introduction to contemporary philosophies, theories, and pedagogies of teaching writing, as well as current scholarship on tutoring and writing centers. Special attention is devoted to analyzing the role(s) of the teacher/tutor, responding to texts-in-progress, and continuing to strengthen cadets' abilities as readers and writers. This course serves as a foundation in the principles in rhetoric and composition that will prepare cadets for (but not guarantee) employment as peer consultants in the VMI Writing Center. Cadets cannot take this course if they have already taken WR 220. Prerequisite(s): ERH 102, WR 102, or EN 102, with a minimum grade of C.

ERH 301—Rhetoric and Public Address

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A study of the principles and techniques of effective public speaking and listening practices through examination of a variety of historical and contemporary examples. The course offers advanced practice in persuasive, public address with extensive instructor and peer feedback. Prerequisite(s): ERH 102, WR 102, or EN 102, with a minimum grade of C, and ERH 103 or SE 300.

ERH 302—Civic Discourse

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An examination of civic discourse and the major theories of rhetoric that define and shape acts of public literacy today. Particular attention will be devoted to the role that language plays in shaping knowledge, identity, and community, and the way different definitions, purposes, and strategies of rhetoric help us to construct meaning. Cadets will write for real audiences in the public domain. Prerequisite(s): ERH 102, WR 102, or EN 102, with a minimum grade of C.

ERH 303—Cultural Rhetorics

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A close examination of a significant event, social movement, or major figure particular to a distinct local or global culture. Through the analysis of oral, written, and visual texts, cadets will study and draw conclusions about the rhetorical strategies that drive cultural movements. Course is repeatable based on topic area. Prerequisite(s): ERH 102, WR 102, or EN 102, with a minimum grade of C.

ERH 304—Language and Style

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An intermediate writing course that focuses on the study of style, one of the five canons of rhetoric. Cadets will develop their abilities to read, draft, and revise complex texts, paying special attention to the relationship between style and meaning. Prerequisite(s): ERH 102, WR 102, or EN 102, with a minimum grade of C.

ERH 311-313—Professional Writing (Discipline/ Field Specific)

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An examination of contemporary issues through the written discourse of professional communities. These seminars will treat select professions—law, the government, the military, the arts, among others. Cadets will study the profession's rhetorical traditions, read and analyze significant texts from a rhetorical perspective, and develop writing projects that evolve from relevant reading, research, and experiences with professionals in the field. Projects with practical application for external audiences will be emphasized. Prerequisite(s): ERH 102, WR 102, or EN 102, with a minimum grade of C.

ERH 314—Technical Communication

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An introduction to the conventions of writing in the workplace. By completing projects for select audiences, purposes, and occasions, cadets will develop the ability to communicate technical information clearly and effectively. Prerequisite(s): ERH 102 with a minimum grade of C.

ERH 321—British Literature in Cultural Context

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A study of particular works, authors, or movements focusing on the ways in which cultural and historical context have influenced the composition of and response to literature in Great Britain. Prerequisite(s): ERH 102, WR 102, or EN 102, with a minimum grade of C.

ERH 322—American Literature in Cultural Context

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A study of particular works, authors, or movements focusing on the ways in which cultural and historical context have influenced the composition of and response to literature in the United States. Prerequisite(s): ERH 102, WR 102, or EN 102, with a minimum grade of C.

ERH 323—Philosophy and Literature

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An exploration of similarities and differences between the allegedly ancient enemies, philosophy and literature. Questions to be explored might include: Is literature all subjective, working only to stir emotions? Is philosophy capable of purely objective reasoning? Do philosophy and literature share any goals? Prerequisite(s): ERH 102, WR 102, or EN 102, with a minimum grade of C.

ERH 331—Aesthetics

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An introduction to the field of aesthetics, the philosophical study of art and beauty. Questions to be explored might include: Is beauty in the eye of the beholder or are some works really better than others? How can we know? What exactly is a work of art? Prerequisite(s): ERH 102, WR 102, or EN 102, with a minimum grade of C.

ERH 332—Logic and Critical Thinking

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A study of logic designed to improve cadets' ability to identify, analyze, and evaluate arguments, understood not as forms of verbal combat but as cases of reasoning from premises to a conclusion. The course aims to improve critical thinking skills and the ability to defend one's own beliefs rationally. Cadets cannot take this course if they have already taken PH 301. Prerequisite(s): ERH 102, WR 102, or EN 102, with a minimum grade of C.

ERH 341—Contemporary Art Since 1945

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An examination of the diverse and challenging explosion in art that occurred after the Second World War, from Abstract Expressionism in the 1940s to digital art of the 21st century. Issues such as personal and social identity, cultural and historical occurrences, new media and methods of artistic production, and the overall "shock" that contemporary art presents to modern audiences will be explored. Cadets cannot take this course if they have already taken FA 362. Prerequisite(s): ERH 102, WR 102, or EN 102, with a minimum grade of C.

ERH 352—Practicum

Lecture Hours: 0 **Lab Hours:** 3 **Credit Hours:** 1

A required or optional co-requisite for any course in the departmental curriculum to provide opportunities for practical experiences, including (but not limited to) studio work, editing and design, or tutoring. This course is repeatable. Prerequisite(s): ERH 102, WR 102, or EN 102, with a minimum grade of C.

ERH 361-362—Independent Study

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Intermediate independent reading, research, and/or writing projects that build on previous oursework in the major, pursued under the supervision of a member of the faculty. Prerequisite(s): ERH 102, WR 102, or EN 102, with a minimum grade of C.

ERH 370-379—Studies in Art and Culture

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An examination of selected media in light of a particular culture's history and ideals, beginning with such foundational questions as: What defines a culture? What is the relationship between artistic expression and cultural concerns and values? In what ways is art political? Prerequisite(s): ERH 102, WR 102, or EN 102, with a minimum grade of C.

ERH 411—Fieldwork

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course gives cadets opportunities to practice good citizenship by engaging in community-based service learning. Cadets' fieldwork experiences may also involve projects for business, professional, or non-profit organizations. Cadets may choose to work individually with a faculty advisor or to enroll in a regularly scheduled class. Fieldwork experiences must both bear significant academic components and conform to departmentally established requirements and learning outcomes. Prerequisite(s): ERH 102, WR 102, or EN 102, with a minimum grade of C.

ERH 421—One Text

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An examination of a single masterwork—literary, philosophical, or artistic—focused on the ways in which cultural and historical context influence the production of and responses to texts. Prerequisite(s): ERH 102, WR 102, or EN 102, with a minimum grade of C.

ERH 422—Major Figures

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An in-depth study of the work of one major rhetorician, philosophy, writer or artist. Prerequisite(s): ERH 102, WR 102, or EN 102, with a minimum grade of C.

ERH 461-462—Independent Study

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Advanced independent reading, research, and/or writing projects that build on previous coursework in the major, pursued under the supervision of a member of the faculty. Prerequisite(s): ERH 102, WR 102, or EN 102, with a minimum grade of C.

ERH 470-479—Seminar in Rhetoric and Writing

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Focused study of a specific topic in rhetoric and writing, including (but not limited to) historical and theoretical studies, linguistics, creative writing, or writing for a profession such as journalism. Prerequisite(s): appropriate upper-level rhetoric or writing course (as specified in registration materials) or permission of the department head.

ERH 481—Senior Capstone Course

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A seminar in which cadets will demonstrate their comprehensive achievement of the learning outcomes in the major by creating a capstone e-portfolio and making an oral presentation to the department faculty. Prerequisites: First Class standing; completion of all Major Core Requirements and at least three required electives. Cadets cannot take this course if they have already taken EN-480W.

ERH 495—Honors Thesis I

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A program of reading and research, including preparation of an annotated bibliography and prospectus, for an honors thesis in the major. Prerequisites: completion of all Major Core Requirements and at least three required electives; a 3.2 average in the major; and approval by the department head. Cadets cannot take this course if they have already taken EN 495.

ERH 496—Honors Thesis II

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Completion of the thesis for honors in the major. Prerequisite(s): A grade of B or higher in ERH 495 and approval by the department head. Cadets cannot take this course if they have already taken EN 496.

French

Department of Modern Languages and Cultures

Department Head: Col. Sunnen

All cadets who enter with two or more entrance units in a modern foreign language are given placement tests and are placed in appropriate courses on the basis of the test results combined with their previous high school language coursework, and after consultation with the department head of modern languages.

A single year of a foreign language shall count toward meeting graduation requirements only when the cadet is studying a second language or is taking a language as an elective.

Cadets must demonstrate proficiency in ML 101 in order to be admitted into ML 102. They must, similarly, demonstrate proficiency in ML 102 before enrolling in ML 201, and in ML 201 before enrolling in ML 202/204. Proficiency in ML 202/204 is a prerequisite for admission to 300-level courses. Completion of two 300-level courses or their equivalent is expected before enrollment in any 400—level course. Once a cadet has completed work at the 202/204 level, he/she may not return to the elementary level course for credit.

Cadets who present four years of a high school language or demonstrate native or near-native language abilities may not enroll at the elementary level of that language. Such students will have the choice of enrolling either in the first semester intermediate level of that language or in the first semester elementary course of a different language.

FR 101—Elementary French I

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An introduction to the fundamentals of French. Primary emphasis on the acquisition of the basic language skills (comprehending, speaking, reading, and writing). Intended for beginners with no previous experience in the language.

FR 102—Elementary French II

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A continuation of FR 101. Prerequisite(s): FR 101.

FR 201—Intermediate French I

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A systematic review of grammar and the readings of texts of significant literary, cultural or historical value. Composition, aural and oral work continued. Prerequisite(s): FR 102.

FR 202—Intermediate French II

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A continuation of FR 201. Prerequisite(s): FR 201.

FR 252X—France and the French

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A comprehensive, interdisciplinary survey of French culture that may include topics ranging from the earliest times to the present, with particular attention to literature, the arts, thought, politics, society, food, and customs. Taught in English. This course does not include a foreign language component and cannot be used toward a language requirement. Note: Retakes for credit. Civilizations & Cultures Course (X).

FR 304—French Composition and Conversation

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Designed for students who wish to gain a command of spoken and written French. Conducted in French. Prerequisite(s): FR 202.

FR 305W—French Thought Across the Centuries I

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A survey of French literature, its forms and themes from the medieval period through the French Revolution. Prerequisite(s): one 300-level French course. Prerequisite(s): one 300-level French course. Writing Intensive (W)

FR 306W—French Thought Across the Centuries II

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A survey of French literature, its forms and themes since the French Revolution through the present. Prerequisite(s): one 300-level French course. Writing Intensive (W)

FR 307—Intensive Review of French Grammar and Phonetics

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Provides essential grammar review and introduction to French phonetics. Prerequisite(s): FR 202

FR 310—Introduction to French Literature

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Introduction to reading and analyzing literary works with emphasis on the development of writing skills in French. Methods, terminology, and practice of literary interpretation. Concentration on shorter works from diverse genres. Prerequisite(s): one 300-level FR course.

FR 314—French Civilizations and Cultures

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A survey of the historical, philosophical, literary, and artistic development of France and/or French-speaking regions, from early times to the present. Prerequisite(s): one 300-level FR course (or with a 300-level FR course), or by departmental permission.

FR 315—Introduction to Francophonic Texts

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Builds on reading skills acquired in FR 201 and FR 202 by presenting a variety of texts from many fields of interest: politics, business, literature, history. Conducted in French. Prerequisite(s): FR 202

FR 316W—Topics in French

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

The topics will vary to reflect cadet and professional interests. The goal of this course is to provide information and foster discussion of diverse topics for the French and Francophone world and to reinforce language skills. Taught in French. Note: Retakes for credit. Writing Intensive. Prerequisite(s): one course at a FR300-level.

FR 335—Intermediate French Converstion

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Guided discussions designed to increase fluency, improve pronunciation, and acquire vocabulary in French. Note: This course may be repeated for credit. Prerequisite(s): one 300-level FR course.

FR 365—Professional Communication in Government and Enterprise

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Interdisciplinary study of key aspects of technical French language for government and business, together with an exploration of the history, sociology, and culture of professional environments in the French and Francophone worlds. Exploration of cultural and professional relations among Francophone Africa and France, the European Union, and the United States. Prerequisite(s): one 300-level FR course.

FR 404W—Applied French Grammar and Composition

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Systematic grammar review with extensive practice in writing French. Note: Writing Intensive Course (W). Prerequisite(s): FR 304 or FR 307 plus one additional 300-level FR course.

FR 405—Independent Reading

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Directed readings of major literary works. Research paper is required. Note: Retakes for credit. Prerequisite(s): Permission of the Department Head.

FR 406—Independent Reading

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Directed readings of major literary works. Taught in French. Research paper is required. Note: Retakes for credit. Prerequisite(s): Permission of the Department Head.

FR 421—French Literature and Civilization I

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Study of political, social, intellectual, artistic and literary development of French culture during the medieval, Renaissance and early modern periods. Prerequisite(s): FR 310 and one other 300-level course.

FR 425—French Literature and Civilization II

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Study of political, social, intellectual, artistic and literary developments in French culture, from the French Revolution through the present. Prerequisite(s): FR 310 and one other 300-level FR course.

FR 430—Indroduction to Francophone Studies

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Study of the literatures and cultures of French-speaking countries outside of France that may include Africa, the Caribbean, Quebec and South East Asia. Prerequisite(s): FR 310W and one other 300-level FR course.

FR 435—Advanced French Conversation

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Guided discussions centered on specific topics. Designed to increase fluency, improve pronunciation, and knowledge of French culture and language. Extended oral presentations. Note: This course may be repeated for credit. Prerequisite(s): FR 335

FR 450—Modern Language Capstone Course

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

The student will choose a topic incorporating an analysis of historical, literary or cultural factors in the major language area—field experience and interdisciplinary topics are strongly encouraged. Upon approval of the faculty adviser, the student will prepare both a research paper and a 20-minute oral presentation. This course is open to first and second class Modern Language majors or minors. The ML Capstone project will be written in the student's major foreign language, as appropriate, and it will achieve a language rating of "Advanced-High". All relevant documentation will adhere to MLA specifications. An accepted ML Honors Thesis could substitute for this course.

FR 455—France Today

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Social, political, and economic trends from 1939—present, with emphasis on the period since 1968. Prerequisite(s): two 300-level FR courses.

FR 460—Studies in French and Francophone Culture

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Representative topics include: History of Paris, Role of the Family in French Literature and Culture, Interrelationships of the Arts, French-speaking African Culture, Culture of French Canada, Sustainable Development. Retakes for credit.

courses.

Prerequisite(s): two 300-level FR courses.

FR 470—Special Topics in French

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An advanced topics course that will vary to reflect cadet and professorial interests on a period, theme, author(s), genre or movement. This course fosters a close reading of text and discussion of diverse topics from the French-speaking world to reinforce advanced language and cultural knowledge. Prerequisite(s): FR 310W and one other 300-level FR course.

Geology

Department of Civil and Environmental Engineering

Department Head: Capt. Riester

Requirements for a major in Civil Engineering are specified in Civil and Environmental Engineering.

GE 306—Engineering Geology

Lecture Hours: 3 **Lab Hours:** 3 **Credit Hours:** 4

Earth material properties and geological processes as they apply to the solution of engineering problems. Case histories, rich visual imagery, a field trip, and three hours of lab per week assist in fully developing this "Natural Science Elective." Prerequisite(s): Enrollment in civil engineering or permission of instructor.

German

Department of Modern Languages and Cultures

Department Head: Col. Sunnen

All cadets who enter with two or more entrance units in a modern foreign language are given placement tests and are placed in appropriate courses on the basis of the test results combined with their previous high school language coursework, and after consultation with the department head of modern languages.

A single year of a foreign language shall count toward meeting graduation requirements only when the cadet is studying a second language or is taking a language as an elective.

Cadets must demonstrate proficiency in ML 101 in order to be admitted into ML 102. They must, similarly, demonstrate proficiency in ML 102 before enrolling in ML 201, and in ML 201 before enrolling in ML 202/204. Proficiency in ML 202/204 is a prerequisite for admission to 300-level courses. Completion of two 300-level courses or their equivalent is expected before enrollment in any 400—level course. Once a cadet has completed work at the 202/204 level, he/she may not return to the elementary level course for credit.

Cadets who present four years of a high school language or demonstrate native or near-native language abilities may not enroll at the elementary level of that language. Such students will have the choice of enrolling either in the first semester intermediate level of that language or in the first semester elementary course of a different language.

GR 303W—Introduction to Contemporary German Culture I

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A study of contemporary German issues including cultural events, travel, economy, politics, education, transportation, and public opinion. Note: Writing Intensive (W). Prerequisite(s): GR 202X.

GR 304W—Introduction to Contemporary German Culture II

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A study of contemporary German issues focusing on economy and German for business. Note: Writing Intensive (W). Prerequisite(s): GR 202X.

GR 307—Literature Survey (1100-1700)

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Authors and works include: the Nibelungenlied, Hartmann von Aue, Martin Luther, Hans Sachs, Andreas Gryphius and others. Prerequisite(s): GR 202X.

GR 308—Literature From the Enlightenment to Revolution

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course treats the literature and philosophy of the Enlightenment, classicism (Goethe, Schiller), romanticism (Kleist, Grimm) and the Zensur that led up to the 1848 revolution. Prerequisite(s): GR 202X.

GR 316—Topics in German

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A topics course that varies to reflect cadet and professorial interests. The goal of this course is to provide information and foster discussion of diverse topics from the German-speaking world and to reinforce the language skills of all cadets enrolled. The language of instruction is German. Note: Retakes for credit. Prerequisite(s): GR 202X.

GR 329—Soldiers, Orders and War: Views from Central Europe

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A sampling of dramas from Germany, Switzerland, and the Austro-Hungarian Empire on the theme of military life and challenges. Taught in English. This course does not include a foreign language component and cannot be used toward a language requirement. Cadets may not earn credit for both GR 333 and GR 413. Prerequisite(s): None.

GR 330X—Satire in Germany—Empire, War, Republic 1900-1933

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Focuses on popular satire and analyzes events and caricatures chronologically. The course addresses cultural balance of authority and revolt with humor, as presented by German citizens, writers, and artists. This course is taught in English and cannot be used toward a foreign language requirement. Note: Civilizations & Cultures Course (X). Prerequisite(s): none.

GR 331X—The Resistance in Nazi Germany: The Best and Brightest and the "Oath-Breakers"

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Designed to examine the opposition to Hitler and the affirmation of the rule of law, which became a firm basis for the modern German military (*Bundeswehr*). Literary, historical, and biographical readings and films relate to the Resistance in Nazi Germany and depict life during the dictatorship and the vision—and fate—of those who opposed it. This course does not include a foreign language component and cannot be used toward a language requirement.

GR 332X—From Wehrmacht to Bundeswehr: A Tradition Destroyed and Rebuilt

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A focus on the transition from a conquered nation to an ally of NATO and backbone of the European Union. Students examine historical and literary texts which address the shaping of German culture and identity in the years following the "zero hour" of May, 1945 and the efforts to define Germany and the role of its military forces, from the division in 1949 to the reunification in 1990. This course does not include a foreign language component and cannot be used toward a language requirement.

GR 405—Seminar in German Literature I

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Directed readings of major literary works; written reports and a research paper required. Taught in German. Note: Retakes for credit. Prerequisite(s): Permission of the department head.

GR 406—Seminar in German Literature II

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Directed readings of major literary works; written reports and a research paper required. Taught in German. Note: Retakes for credit. Prerequisite(s): Permission of the department head.

GR 411—Vienna, Berlin, and Between: Germany and Austria From 1911-1950

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A study of Hermann Hesse, Robert Musil, Ernst von Salomon, Hugo von Hofmannsthal, among others. This course focuses on how Austrians and Germans saw the world during the first half of the 20th century. Prerequisite(s): 6 hours of 300 level German.

GR 412—German on Both Sides of the Iron Curtain

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A continuation of GR 411. Students will study the unique situation of the two Germanys during the Cold War. Emphasis on Heinrich Böll and Ulrich Plenzdorf. Prerequisite(s): 6 hours of 300 level German.

GR 413—Germany and the Military

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course treats depictions of military life and war in literature with emphasis on German traditions and attitudes. Authors include Erich Maria Remarque and Hans Hellmuth Kirst. Prerequisite(s): 6 hours of 300 level German.

GR 420W—Advanced Conversation and Composition

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Students examine, discuss, and debate current events of political and military topics, such as the restructuring and deployment of the Bundesweht and Germany's role in the European Union. E-portfolios will constitute an important part of this course. Prerequisite(s): 6 hours of 300 level German. Writing Intensive (W).

GR 421—Immigration to and From Germany Since 1850

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Readings will focus on immigration to the New World, starting in the 19th century, and the influx of immigrants to Germany after World War II. Prerequisite(s): 6 hours of 300 level German.

GR 450—Modern Language Capstone Course

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

The student will choose a topic incorporating an analysis of historical, literary or cultural factors in the major language area—field experience and interdisciplinary topics are strongly encouraged. Upon approval of the faculty adviser, the student will prepare both a research paper and a 20-minute oral presentation. This course is required of all Modern Language majors and is only open to first and second class Modern Language majors. The ML Capstone project will be written in the student's major foreign language, as appropriate, and it will achieve a language rating of "Advanced-High". All relevant documentation will adhere to MLA specifications. An accepted ML Honors Thesis could substitute for this course.

History

Department of History

Department Head: Col. Wilkinson

Requirements for a major in history are specified in History.

HI 103—World History I

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A study of the world's major civilizations prior to 1500, concentrating on their primary values and institutions, and their cultural contacts. Particular attention devoted to the Middle East, China, India, the Mediterranean world, and Western Europe.

HI 104—World History II

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A study of the world's major civilizations since 1500, the rise and expanding influence of the West, and the interaction between the West and non-West.

HI 200—Introduction to Historical Methods

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course develops essential skills for historians such as: critical reading and thinking, basic research methods and the fundamentals of organizing, writing and documenting history papers in accordance with the standards of the discipline. Subject matter varies. Required for majors; restricted to majors. Normally taken in the third year. Note: A grade of "C" or better is required as a prerequisite to one of the 300-level methodologically intensive courses.

HI 205—History of the United States I

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A general survey of American history beginning with the Colonial Period and ending with 1877. The approach is broad with attention being given to political, diplomatic, constitutional, intellectual, social, and economic trends. Required of history majors and minors. May be taken as a writing-intensive course when offered (205W).

HI 205W—History of the United States I

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A general survey of American history beginning with the Colonial Period and ending with 1877. The approach is broad with attention being given to political, diplomatic, constitutional, intellectual, social, and economic trends. Note: Required of history majors and minors. Writing Intensive Course.

HI 206—History of the United States II

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A general survey of American history covering the period 1877 to the present. The approach is broad with attention being given to political, diplomatic, constitutional, intellectual, social, and economic trends. Required of history majors and minors.

HI 210-299—Special Courses

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Occasional courses on special topics in history may be offered by visiting faculty members or by departmental faculty. These courses fulfill regional distribution requirements if their regional category is included in the course announcement before registration.

HI 223—Islam in North America and Western Europe

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Islam is believed to be growing faster than any religion in the United States today and is the second largest religion in Europe. This course will examine the past and contemporary history of Muslims in the West, including the emergence and development of Muslim communities and institutions, Islamic devotional life and education, the impact of Muslims' immigration into Western societies. Attention will be given to the interaction between Muslim and Christian communities and to the official policies of Western governments toward their Muslim citizens and residents. This is a Methodologically Intensive course intended primarily for History majors.

HI 301—Ancient Egypt

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An upper-level survey course covering the history of Egypt from the pre-dynastic period through the Roman occupation. Note: Region: Africa/Asia/Latin America. May be offered as 301X (Civilizations & Cultures), 301W (Writing Intensive), or both 301WX.

HI 302—Ancient Greece

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An upper-level survey course which covers the Greek world from the Trojan War to the death of Cleopatra. Note: Region: Europe or Africa/Asia/Latin America, but not both. May be offered as 302X (Civilizations & Cultures).

HI 303—Ancient Rome

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An upper-level survey course which covers the Roman world from the early Iron Age settlements in Italy to Rome's conquest of the Mediterranean and the fall of the empire. Note: Region: Europe or Africa/Asia/Latin America, but not both. May be offered as 303X (Civilizations & Cultures).

HI 304—The Medieval World

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An upper-level survey of eastern and western Europe from the fall of Rome to the eve of the Renaissance, and Islam as it impacted these areas. Note: Region: Europe or Africa/Asia/Latin America. May be offered as 304X (Civilizations & Cultures), 304W (Writing Intensive), or both 304WX.

HI 305—Jacksonian America (M)

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This methodologically intensive course will examine the history of the United States from the War of 1812 to the mid-1840s. Topics will include the expansion of the United States in an age of global revolutions as well as the rise of populism as embodied in the life and careers of Andrew Jackson. Historical and historiographical issues will be covered via analysis of popular beliefs and prejudices. Cadets' primary goal will be to progress through the stages of structuring and writing a research essay. Note: Methodologically Intensive Course (M).

HI 306—Religion and Warfare in Nineteenth Century United States History

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An upper-level survey course covering the expansionist Protestant ideology in the nineteenth-century United States as it came into conflict with Native Americans, Catholic immigrants, and hemispheric neighbors. The interaction between politics and millenarian religious beliefs will be studied in the context of four nineteenth-century wars, from 1812 to 1898.

HI 307—English History I

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A study of English history from Stonehenge to the Glorious Revolution of 1688. The focus is on social, cultural, and constitutional history, as they illuminate political trends. Note: Region: Europe.

HI 308—English History II

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A study of English history from 1688 to the present. The focus is on England's transition to an industrial democracy without a revolution, Victorianism, and the rise to global influence and subsequent decline. Note: Region: Europe.

HI 309—History of the Holocaust

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A study of the causes, events, and results of the Nazi attempt to destroy the Jews of Europe. Topics to be considered are: the history of the Jewish people; the causes and history of anti-Semitism; the Nazi rise to power and persecution of the Jews; the actions and motives of Holocaust perpetrators, victims, and bystanders; and the impact of the Holocaust on contemporary history. May be offered as a writing intensive course (309W) at the Instructor's discretion. Note: Region: Europe.

HI 310X—War and Society in Modern China

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course introduces cadets to the 100-year cycle of civil war and international conflict that China experienced from the Opium War until the Communist victory of 1949. Major topics include warlords, imperialism, the Sino-Japanese wars of the 1930s, World War II in China and the Communist victory in China's civil war. We will study not only the experience of the war for combatants and citizens, but also the domestic and international causes and ramifications of conflict. Note: Region: Asia/Africa/Latin America. Civilizations and Cultures Course (X). Prerequisite(s): HI 104.

HI 311—History of the Cold War

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course surveys the Cold War from the origins of great power confrontation in the World War II era, through such key episodes as the Cuban Missile Crisis, the construction of the Berlin Wall, the Prague Spring, Detente, and its decline. We will emphasize shifting historical interpretation of the era, as well as the assessment and employment of primary source documents in historical analysis. Students are required to write a term paper combining a historiographical review with research on one major episode. The course may be team-taught to provide multiple perspectives. Region: Europe/U.S./Latin America-Asia-Africa depending on topic. Methodologically intensive. Prerequisite(s): HI majors must complete HI 200 with a minimum grade of C. Non-HI majors require permission of instructor.

HI 312—Introduction to the History of Islam

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

The course traces the history of Islam, beginning with the life of the Prophet Mohammad and the formative period, along with its medieval achievements and modern situation. Aspects of analysis include the historical development, social institutions, intellectual traditions, and religious system of Islam. We will explore this history using a range of primary and secondary materials including religious texts, historic chronicles and works of fiction.

HI 313—The United States, 1900-1945

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A comprehensive study of the United States during the Progressive Era, World War I, the 1920s, and the Great Depression. Note: Region: United States.

HI 314—The United States Since 1945

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A comprehensive study of the United States from World War II through recent years. Note: Region: United States.

HI 315—The History of Everyday Life

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Social history is an approach to the past that deemphasizes the study of "famous men, great ideas, and big events" in favor of description and analysis of the lives of ordinary people of the past and the social and economic structures that shaped their lives. This course introduces students to sources and methods for the study of "history from the bottom up" and focuses on topics such as family life, courtship and marriage, sex and death, patterns of work and leisure, gender relations, childhood and youth, and old age. Note: Region: Europe or United States, but not both. Methodologically intensive. Prerequisite(s): HI majors must complete HI 200 with a minimum grade of C. Non-HI majors require permission of instructor.

HI 316—Food and Hunger in History

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course explores themes and issues relating to social and cultural dimensions of food and food shortages in past times. The course ranges widely across time and space and adopts an explicitly comparative approach. Topics examined include the transition from hunting and gathering to agriculture, the historical development of food production and distribution systems, the emergence of staple crops as commodities, and the causes and consequences of food shortages. The course is open to students of all majors who have passed both semesters of World History (HI 103 and HI 104). Prerequisite(s): HI 103 and HI 104. This course may be offered as a "Civilizations and Cultures" course (HI 316X), a "Writing Intensive" course (316W), or both (316WX).

HI 317—The Great Depression and the New Deal

This methodologically intensive course will focus on United States history from the origins of the Great Depression to the end of the New Deal. Topics will include the political, economic, social, and cultural history of the era. Specific emphasis will be placed on the origins and effects of the Great Depression, the stock market crash, and the nature of the institutional responses offered by Franklin Roosevelt's New Deal. Cadets will engage both historical and historiographical topics while completing a significant research project. Note: Geographical Region: United States. Methodologically Intensive. Prerequisite(s): HI majors must complete HI 200 with a minimum grade of C. Non-HI majors require permission of instructor.

HI 318—George C. Marshall and the American Century

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A methodologically-intensive course designed to develop research and analytical skills through the intensive study of the career of General of the Army George C. Marshall, VMI class of 1901. Class will focus on teaching students how to find, analyze, organize, and present primary and secondary sources material. In doing so, student will explore the manuscript collections at the VMI archives and George C. Marshall Research Library. The course will explore major trends in U.S. military history and foreign relations from the Spanish-American War (1898) to the Korean War (1950-1953). Note: Members of the First Class **May Not** enroll in this course. Region: United States. Methodologically Intensive. Prerequisite(s): HI majors must complete HI 200 with a minimum grade of C. Non-HI majors require permission of instructor

HI 319—African American Experience

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A general introduction to the African American experience in the United States beginning in Africa in the 15th century and continuing through to the late 20th century. Note: Region: United States. Methodologically intensive. Prerequisite(s): HI majors must complete HI 200 with a minimum grade of C. Non-HI majors require permission of instructor.

HI 320—The Progressive Era (M)

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This methodologically-intensive course will examine the United States during the Progressive Era—roughly 1890-1920—one of the most dynamic periods in American history. Focusing on the political, economic, social, and cultural changes of the era, the central focus will be an examination of the United States' transformation into an increasingly diverse, industrial, urban, and internationalist nation. Note: Methodologically Intensive Course (M). Prerequisite(s): HI 200 with a minimum grade of C.

HI 321—The Old South

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

The social, intellectual, economic, and political history of the American South before the Civil War. Major topics include the plantation system, slavery, and the evolution of southern sectionalism. Note: Region: United States.

HI 322—The Civil War and Reconstruction

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

The causes and course of the American Civil War and the issues and consequences of Reconstruction. Note: Region: United States.

HI 323—History of the South From 1865

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Political, social, economic, cultural, and demographic history of the Southern United States from 1865 to the present, with emphasis on interpretations of Southern history by twentieth-century historians. Topics include Reconstruction, segregation and disfranchisement, the "New South Creed" and industrialization, the Civil Rights Movement, and Southern popular culture. Note: Region: United States. Methodologically intensive. Prerequisite(s): HI majors must complete HI 200 with a minimum grade of C and HI 206. Non-HI majors require permission of instructor.

HI 324—American Foreign Relations to 1919

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An upper level survey of American foreign relations from the founding of the nation through World War I. Emphasis will be placed on the securing of American independence, continental expansion of the mid 19th century and the global expansion of American interests in the late 19th and early 20th centuries. Considers the interplay of diplomacy, security issues, economics and culture in American relations with the world. Note: Region: United States.

HI 325—American Foreign Relations Since 1919

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An upper level survey of American foreign relations from the end of World War I until recent times. Important topics include America's emergence as a leading economic power, the background to World War II, the rise and the demise of the Cold War and American attempts to cope with the post-Cold War world. Note: Region: United States. Prerequisite(s): Prior completion of HI 324, "American Foreign Relations to 1919" is recommended, but not required.

HI 326—19th Century South Africa: War, Cross and Gold

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This methodologically intensive course will focus on the history of nineteenth-century South Africa at a time when social and political communities in the region were radically transformed by encounters with European soldiers, missionaries and mining capitalists, setting the stage for the origins of apartheid South Africa. Cadets will explore the major historiographical issues and relevant primary sources as they prepare a substantial independent research paper. Prerequisite(s): HI 200 with a minimum grade of C. Note: Methodologically Intensive

HI 327—India From the Age of the Harrapans to the Present Day

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An upper-level survey of the history of India from the earliest age of complex society on the subcontinent to the present day. Topics include the development of India's religions, the caste system, art, philosophy, and politics as well as India's role in European imperialism. In addition, the class will examine the development of India post-1945 to illustrate the rising importance of the country on the modern international stage. Note: Region: Africa/Asia/Latin America. May be offered as a "Civilizations and Cultures" course (HI 327X).

HI 328—British Imperialism

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An upper-level survey that will examine the growth of the British empire beginning in 16th century England and examine the importance of the institution to British development and the impact that it had on world history. Topics include the ideology underpinning the institution and changes to imperial ideology over time, the political growth of the empire and its role in British diplomacy, the economic impact of it on British life, and the effect of it on indigenous populations. Finally, the course examines the legacy of British imperialism in the modern world. Note: Region: Europe or Africa/Asia/Latin America.

HI 329—War and Society in Twentieth Century United States History

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course focuses on the themes that have defined America's and Americans' experiences of conflict during the 20th century. The central project will be to explore the relationship between war and society from a variety of perspectives while critically engaging the events and processes that shaped the United States' evolving relationship with conflict during a tumultuous period.

HI 330—Topics in Ancient History

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A problems course covering selected topics in the ancient world, historical controversies, and major turning points. The course presumes a general knowledge of the ancient world from the first semester of Western or World Civilization. The three civilizations discussed will be the Ancient Near East, Greece, and Rome. Note: Region: Europe or Africa/Asia/Latin America, but not both. Methodologically intensive. Prerequisite(s): HI majors must complete HI 200 with a minimum grade of C. Non-HI majors require permission of instructor.

HI 331—Colonial America

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A study of eastern North America from contact through the Seven Years' War. Explores major social, political, religious, and economic trends, plus evolving relationships with Indians. Note: Region: United States. Methodologically intensive. Prerequisite(s): HI majors must complete HI 200 with a minimum grade of C. Non-HI majors require permission of instructor.

HI 332—North American Indians

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A survey of North American Indian history from late pre-contact through the twentieth century. Requires a major research paper on one tribe north of Mexico. Note: Region: United States.

HI 333—History of the Middle East I

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Surveys the history of the Middle East and North Africa from the rise of Islam in the 7th century in Arabia to the beginning of the modern era in the 1800s. Focuses on political, social, and cultural aspects of Islamic Civilization. Note: Region: Africa/Asia/Latin America.

HI 334—History of the Middle East II

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Continues the history of the Middle East in the modern period, from the 1800s to the present. Starting with a brief overview of the late Ottoman empire, follows political, social and cultural developments of the region. Focuses on the interaction with the West, evolution of the modern state system, and the rise of political Islam. Note: Region: Africa/Asia/Latin America.

HI 335—The Vietnam War

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Traces the military, political, and diplomatic history of Vietnam from the earliest times to the present. The course emphasizes the period after the second World War: the Indo-China War, and especially, the Vietnam War. Note: Region: Africa/Asia/Latin America.

HI 346—Modern Japan

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An examination of the rise of modern Japan from the mid-19th century to the present. Topics that will be covered are: the opening of Japan and the Meiji Restoration, economic modernization, nationalism and expansionism, political development, militarism and the Pacific War, American occupation, postwar Japan and the economic miracle. Note: Region: Africa/ Asia/ Latin America.

HI 347X—Africa in Pre-Modern Times, to 1850

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Survey of the historical experiences that have shaped contemporary sub-Saharan Africa: African societies' political, economic and cultural responses to the continent's variegated ecological and climatic conditions; the material and cultural exchanges across the continent's North African, Sahelian, Indian Ocean and Atlantic Ocean contact zones; the trans-Atlantic slave trade and the expansion of Christianity in Atlantic Africa; the expansion of Islam and Muslim reform movements. Note: Civilizations & Cultures Course (X).

HI 348—Africa in Modern Times, 1700 to Present

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Survey of the historical experiences that have shaped contemporary sub-Saharan Africa: the slave trade, European partition and imperial rule, and independence and nationhood. Note: Region: Africa/Asia/Latin America.

HI 350—French Revolution and Napoleon

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A study of the collapse of the Old Regime and the causes of the French Revolution, the stages of the Revolution, and Napoleon as a domestic reformer and exporter of the Revolution. The course will emphasize the European context of the age of democratic revolution, 1789-1815. Note: Region: Europe.

HI 355—Grand Strategy in the Twentieth Century

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Examines the coordination of military strategy, mobilization, diplomacy, and other national or coalition instruments to achieve political goals in war during the twentieth century.

HI 358—From Mongols to Manchus: Chinese Imperial History, 1206-1911

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course explores China's imperial history of the Yuan, Ming and Qing (1368-1911) dynasties against the backdrop of the ever changing global context, including the serious military challenges of nomadic peoples, the arrival of western missionaries and merchants, and the fading of the traditional tribute system in the face of western imperialism. Cadets will explore the great East-West economic divergence, as part of China's complex relations with the early modern world, along with the legacies and controversies that the communist government has inherited from imperial China. Note: Region: Asia/Africa/Latin America.

HI 359—China in the Communist Era (1949-Present)

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course explores the history of the People's Republic of China (1949-present) in chronological order and through three overarching themes: the changing politics and structure of the Chinese Communist Party (CCP); the social, economic, cultural, ethnic and religious ramifications of Communist rule in China over sixty years; and China's shifting relations with major global powers and the influences on China's domestic policy changes. Note: Region: Asia/Africa/Latin America.

HI 361—The Age of Blood and Iron. Europe, 1871-1918

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Survey of Europe in the period. This course begins with a discussion of the 1870-1871 Franco-Prussian War. It then successively examines social and economic developments, political developments in the separate European states, imperialism, the division of Europe into two hostile alliance systems, the arms race, the fundamental and immediate causes of the First World War, and the war itself. Note: Region: Europe.

HI 365—France and the French Empire 1815 to the Present

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Surveys the political and socioeconomic history of France and its overseas empire from Waterloo to the present. Significant focus on developments in Africa and Indochina. Note: Region: Europe. Prerequisite(s): No prerequisite, but HI 350 is recommended.

HI 368—Europe, 1919-1939

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Survey of Europe in the period. It begins with the peace settlement following the First World War. Through a chronological approach by country, it treats political, diplomatic, and military trends and events of the period, including the rise of fascism and totalitarianism, and the roles played by individual leaders including Mussolini, Hitler, Stalin, and Churchill. It then deals with events leading to the Second World War. Note: Region: Europe.

HI 372—Reading Course for Honors

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Reading in depth in a selected field of history under the close supervision of a faculty member as preparation for an honors research paper. Introduction to historical methodology and preparation of an annotated bibliography or such other preliminary project(s) as the advisor directs. Note: Methodologically intensive. Prerequisite(s): HI majors must complete HI 200 with a minimum grade of C and have admission to the departmental honors program.

HI 373—Colonial Latin America

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A survey of historical developments from the Iberian Reconquest through the Wars of Independence in Latin America. Note: Region: Africa/Asia/Latin America. Methodologically Intensive. Prerequisite(s): HI majors must complete HI 200 with a minimum grade of C. Non-HI majors require permission of instructor. May also be offered as Writing Intensive.

HI 374—Modern Latin America

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A continuation of HI 373 comprising a survey of historical developments in Latin America in general and certain Latin American Republics from the Wars of Independence to the present. Note: Region: Africa/Asia/Latin America. Methodologically Intensive. Prerequisite(s): HI majors must complete HI 200 with a minimum grade of C. Non-HI majors require permission of instructor. May also be offered as Writing Intensive.

HI 375—Germany and Eastern Europe From Bismarck to Brandt

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Special attention will be given to the nature of the Bismarckian Empire, Germany's role in the origins of World War I, the Weimar Republic, Nazi totalitarianism, and post-war German society. Note: Region: Europe. May be offered as HI 375X (Civilizations & Cultures).

HI 377—Insurgency and Terrorism

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An introduction to the modern history of armed struggle for revolutionary aims and the counterinsurgency campaigns that ensue. In addition to studying the major theorists of insurgency and counterinsurgency, the class will examine specific studies from the late eighteenth century through contemporary conflicts in the Middle East. Note: Methodologically intensive. Region: Europe or Asia/Africa/Latin America, but not both. Prerequisite(s): HI majors must complete HI 200 with a minimum grade of C. Non-HI majors require permission of instructor.

HI 378—European Warfare, 1600-1871

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A survey of the development of modern warfare in Europe from the "Military Revolution" of the seventeenth century through the Franco-Prussian War. In addition to studying the armed forces, important battles, campaigns and wars, the class will explore related social, political, diplomatic, and cultural developments. Key themes will include eighteenth-century limited warfare, French Revolutionary and Napoleonic warfare, the Wars of Italian and German Unification, and military thought and strategy. Note: Region: Europe.

HI 379—European Warfare Since 1871

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course introduces students to major aspects of European warfare from the unification of Germany in 1871 through the Cold War and beyond. Key themes include the evolution of military thought and the operational, political, socio-cultural, and technological aspects of armed forces and war. Note: Region: Europe.

HI 380—Europe in Renaissance and Reformation

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A study of European politics and culture (1400-1648) with an emphasis on the literary and artistic legacy of the Renaissance and on the religious struggles of the Reformation era. Note: Region: Europe. Methodologically Intensive. Prerequisite(s): HI majors must complete HI 200 with a minimum grade of C. Non-HI majors require permission of instructor.

HI 382—Modern Russian History

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A survey of the history of Russia, stressing economic, political, social, and intellectual development during the Empire and the Soviet Union. Note: Region: Europe.

HI 383—Virginia History I

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A survey of the political, social, economic, and cultural history of Virginia from 1607 to 1865. Note: Region: United States.

HI 384—Virginia History II

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A survey of the political, social, economic, and cultural history of Virginia from 1865 to the present. Note: Region: United States.

HI 385—U.S. Military History to 1919

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A survey of American military history through World War I with emphasis on strategy, force structure, technology, and the record of the American armed forces in both war and peace. Note: Region: United States.

HI 386—U.S. Military History Since 1919

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A survey of American military history since World War I with emphasis on strategy, force structure, technology, and the record of the American armed forces in both war and peace. Note: Region: United States.

HI 387—History of Air Power

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An investigation into the development and employment of military aviation in both peace and war. Common threads to be followed include leadership, strategy, tactics, technology, joint operations, and ethical issues. Note: Region: Europe or the United States (but not both).

HI 388—Modern Spain: Civil War and Colonial Conflict

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course introduces students to modern Spanish history, paying particular attention to military affairs. Major themes include the guerrilla struggles against Napoleon, counterinsurgency in Cuba and Morocco, the Spanish Civil War, the dictatorship of Francisco Franco, and ongoing issues of regional nationalism and terrorism. Note: Region: Europe. Methodologically intensive. Prerequisite(s): HI majors must complete HI 200 with a minimum grade of C. Non-HI majors require permission of instructor.

HI 390—Sea Power From the Age of Sail to the Early Twentieth Century

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A survey that deals with the use of naval power in both war and peace from the sixteenth century to the early twentieth century. Dominant themes will include the evolution of strategy and tactics in war, the impact of technology on tactics and shipboard lives, and the overall importance of sea power to the foreign policies of naval powers. Coverage includes discussions that focus on the Seven Years War, the American Revolutionary War, the French Revolutionary and Napoleonic Wars, the War of 1812, the Crimean War, the American Civil War, the Sino-Japanese War, and the Russo-Japanese War. Note: Region: Europe.

HI 391—Sea Power in the 20th Century

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course investigates the employment of naval power in both peace and war during the twentieth century. Among the common threads to be followed are leadership, strategy, tactics, technology, and joint operations. The navies of Great Britain, Germany, Imperial Japan, the Soviet Union, and the United States will receive the closest scrutiny. Substantial class time will be devoted to both world wars, Korea, and Vietnam. Note: Region: Europe or the United States (but not both).

HI 392—World War I

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A survey of the events leading to World War I and the course of the conflict itself. The coverage will include detail on the grand strategy and actions of the principal combatants, tactics, operations, armaments, and logistics. The course will focus on the principal combatants, but will offer worldwide coverage to showcase the magnitude of the war and the importance of regional conflicts on the course of the war. It will also include the effect of World War I, as a total war, on civilians and the world as a whole following the conclusion of peace. Through this coverage, the student will gain an understanding not only of war in the early twentieth century, but also an understanding of the legacy of the war on global development. Note: Region: Europe or the United States, but not both.

HI 393—World War II

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course aims to give students a broad overview of World War II, with a deeper knowledge of certain key themes. Areas of particular emphasis include military thought, "Blitzkrieg" and "Operational Art," the Battle of France, the Eastern Front campaigns, and the realities of warfare in the Pacific. The class also covers such topics as Nazi ideology and the Holocaust. Note: Region: Europe or the United States or Africa/Asia/Latin America (can fulfill one category only).

HI 400—History Internship

Lecture Hours: 0 **Lab Hours:** 0 **Credit Hours:** 1-6

Under appropriate conditions, cadets may earn up to six hours of academic credit in History for research and other academic activities related to an internship sponsored and approved by the History Department. Internships will normally be conducted during the summer and will involve activities away from the Institute. Details of activities and the amount of credit to be awarded must be arranged prior to the commencement of the internship and approved by the head of the History Department.

HI 401—History and Culture of Ghana

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course exposes students to the history and culture of Ghana through a combination of classroom lectures and visits to culturally and historically relevant sites. This course prepares participants for socially and culturally appropriate interactions.

HI 460W—Capstone Experience

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Senior level methodologically intensive research seminar leading to the production of a major research paper. Topics vary. Note: Required of history majors except those who complete the departmental honors sequence. Note Well: HI 460W cannot be used to satisfy a regional distribution requirement. Prerequisite(s): completion of a 300-level methodologically intensive course, and perhaps other prerequisites at the discretion of the instructor. Writing Intensive (W).

HI 480—Directed Study

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Advanced level one-on-one course emphasizing historical methodology and leading to the production of a major research paper. Note: May also be taken as a writing-intensive course (480W) with instructor's permission. Prerequisite(s): a 300-level methodologically-intensive course and possibly other courses as required by the instructor; permission of the department head, completion of twelve hours of history courses numbered 200 or higher taken in residence at VMI, and at least a 3.0 GPA in history courses taken at VMI.

HI 481—Special Seminar

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Seminars on special topics in history as suggested from time to time by members of the faculty or groups of history majors. Course will require completion of a major student research paper.

HI 490—Special Seminar

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Seminars on special topics in history as suggested from time to time by members of the faculty or groups of history majors. Course will require completion of a major student research paper.

HI 491W—Thesis Course for Honors

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Research and writing of the honors paper under the supervision of a faculty member. Note: Course concludes with an oral defense of a draft version of the thesis. Prerequisite(s): HI 372 with a minimum grade of B. Writing intensive (W).

HI 492W—Thesis Course for Honors

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Oral examination on the completed honors paper, followed by its revision and final submission. Prerequisite(s): HI 491W with a minimum grade of B. Writing intensive (W).

Honors Program

Coordinator: Col. Robert McDonald

For information pertaining to the Institute Honors Program, please see Special Programs.

HN 100—Honors Forum

Lecture Hours: 1 **Lab Hours:** 0 **Credit Hours:** 0

The forum provides an occasion for students enrolled in the Institute Honors Program to meet weekly to discuss and debate issues of current national and international interest. Requirements include regular readings in major national newspapers and serious periodicals (e.g., The Economist, The Atlantic). Enrollment is restricted to cadets who have been admitted to the Institute Honors Program.

HN 400—Honors Thesis

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Research for and completion of the Institute Honors thesis under the guidance of a faculty adviser. Cadets may enroll in this course (for one semester or two) or another appropriate research or independent study course in order to earn credit for completing the thesis required for Institute Honors. Enrollment is restricted to cadets in the Institute Honors Program and requires permission of the director of the Institute Honors Program. See Col. McDonald in the Dean's Office for details.

HN 401—Project Research

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Research for and completion of the Institute Honors thesis under the guidance of a faculty adviser. Cadets may enroll in this course (for one semester or two) or another appropriate research or independent study course in order to earn credit for completing the thesis required for Institute Honors. Enrollment is restricted to cadets in the Institute Honors Program and requires permission of the director of the Institute Honors Program. See Col. McDonald in the Dean's Office for details.

HNL Designation—Honors Seminar—Liberal Arts

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

These seminars provide exposure to topics in the liberal arts or leadership. One course in this sequence is required to earn Institute Honors. HNL seminars are writing intensive and are open to all majors. Topics vary by semester. Recent offerings include Shakespeare's Leaders and Grand Strategy in the Twentieth Century.

HNS Designation—Honors Seminar—Science/ Engineering

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

These seminars provide exposure to topics in the sciences or engineering. One course in this sequence is required to earn Institute Honors. HNS seminars are writing intensive and are open to all majors. Topics vary by semester. Recent offerings include Environmental Myth, Ethics, and Justice and Science and Medicine: A Case-Based Approach. Prerequisite(s): Admission to the Institute Honors Program.

HNS 377W—Great Ideas in Mathematics

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A common misconception among students is that mathematics is all about memorizing formulas and applyinng them to specific types of problems. They often carry this error with them throughout life. This course will shatter that misconception. We will take a journey through some of the greatest and most beautiful ideas of mathematics (and human thought in general) as we explore the theory of numbers,the concept of infinity, selected topics in geometry, topology, chaos theory, fractals, and probability. Along the way we will focus on skills and creative ways of thinking that will help solve problems in any area of life. Like all honors seminars, this course is writing-intensive. Prerequisite(s): Enrollment is restricted to cadets who have been admitted to the Institute Honors Program.

HNS 381WX—Info: Past, Present & Future

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

How much information is in this paragraph? Well, you haven't read it all yet, so you don't know. But if it's your second go, how might you measure the information content? By the frequency of large and uncommon words? By the perceived meaning that it relays about the course? By the total number of alphanumeric characters used? In this course we'll explore one method of quantifying information and how this theory of information is used in the modern world. Don't be fooled, though: the essence of information is as old as language itself (and some would argue older). We'll see this in examples ranging from the talking drums of Africa to cryptography during World War II to why your great-great-great grandparents might not be as disapproving of your texting habits as your parents are. Expect to do some math, but no coursework in mathematics beyond the core curriculum is required. Prerequisite(s): Admission to the VMI Honors Program. Note: Writing Intensive (W) & Civilizations and Cultures (X)

International Studies and Political Science

Department of International Studies and Political Science

Department Head: Col. Foster

Requirements for a degree in international studies and political science are specified in International Studies and Political Science.

EC 312—Understanding International Finance Through the Lens of the European Union

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

In this course, we will use the policies and structure of the European Union (EU) and its subset, the Euro zone, to study and understand the theory and principles of the macroeconomic issues of international economics. In particular, we will analyze the EU's 'single monetary policy and heterogeneous fiscal policies' structure to understand how a nation's monetary and fiscal policies are affected by the openness of its economy, how it affects domestic growth, and how it affects the connected foreign exchange markets. The objective of this class is for you to understand, apply and analyze the implications.

IS 201—Introduction to International Studies and Political Science

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This team-taught course introduces students to political science as a discipline and to the different interests of the international studies faculty. It is divided into four sections covering political science, political theory, American politics, comparative politics, and international

relations. Readings are taken from the classics in political science. The focus is on key concepts, such as power, state-society relations, institutions; and on the central debates across the discipline and within the sub-fields. Required for IS majors. Must be attempted in the 3rd class year. Open only to IS majors.

IS 210—American Government

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Examination of our main national governmental institutions and the application of constitutional provisions to their operation. The role of political parties, elections, and public opinion in the American political process.

IS 220—International Politics

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Focuses on the international system of politics and examines the nature of relations between states, the factors which affect the actions and motives of states in their dealings with one another, and selected current problems in international politics.

IS 230—Comparative Politics

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This introduction to the field of Comparative Politics has two main objectives. The first is to provide a foundation of basic empirical knowledge about political institutions and processes in select key countries: Britain, France, Germany, Japan, Russia, China, India, Iran, and Mexico. The second, more open-ended, objective is to engage some of the "big questions" and themes in world politics that engage scholars, political leaders, and (ideally) educated citizens: How and why did modern nation-states emerge in the West? How do the legacies of colonialism and socialism influence political and economic development elsewhere? What are the conditions most conducive to liberal democracy and market capitalism-and do they always go together?

IS 301—Techniques of Computer Analysis

Lecture Hours: 2 **Lab Hours:** 2 **Credit Hours:** 3

A course to teach the fundamentals of computer analysis as practiced by students of international studies, historians, and political scientists. Emphasizes the active use of computers to perform statistical analysis on primary source data from a variety of contemporary and historical sources. Prerequisite(s): open only to international studies majors who have passed IS 201 with a grade of 75 or higher.

IS 302—Special Topics in Asian Studies

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

IS 302 is repeat-number special topics course on Asian Studies. It is assigned to international studies courses taught by the Eugenio Lopez Visiting Chair in Asian Studies. The specific content of a given offering of IS 302 will be determined by the IS Department in consultation with the Lopez Chair. Credit for IS 302 will be applicable to completion of the VMI Asian Studies Minor.

IS 303—Special Topics in Asian Studies

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

IS 303 is repeat-number special topics course on Asian Studies. It is assigned to international studies courses taught by the Eugenio Lopez Visiting Chair in Asian Studies. The specific content of a given offering of IS 303 will be determined by the IS Department in consultation with the Lopez Chair. Credit for IS 303 will be applicable to completion of the VMI Asian Studies Minor.

IS 310—American Foreign Policy

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

The central purpose of this course is to familiarize cadets with prevalent theoretical approaches to decision-making and to use these models to examine the American foreign policy experience. To this end, the course will survey rational, organizational, bureaucratic, and various psychological perspectives. Cadets will then use these tools to critically review the historical development of America's relations with other international actors, including Washington's admonition to steer clear of "foreign entanglements," the world wars, the Cold War, and the current battle against terror. The course concludes with several mock policy debates which are designed to illustrate the intricacies of high-level decision-making and provide insights into the likely conduct of US foreign policy in the 21st Century.

IS 311—The American Congress

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

In the Constitution, the article that describes the duties and functions of the Congress as well as its limitations is longest. The reason for this evident: the Founders considered that the Congress, as the body of government that would pass our laws and control the federal purse, would be at the center of national government and politics. Despite the Presidency's rise in power and reputation, Congress' powers ensure it will be at the center of our constitutional order. Subjects covered will include the ideas that influenced the Founders' ideas of a federal legislature, the powers of the Congress, the leadership and organizational structure of Congress (with an emphasis on the committee system), the legislative process, the Congress' relationship with the President (especially on issues of national security), and electoral politics.

IS 312—The American Presidency

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

The American Presidency is a political institution like no other in the world. Born of the Founding Fathers' wariness of the concentrated political power, the office is a blend of head of state, commander-in-chief, chief of party, and head of government. Its evolution has been central to the development of American national government and Americans' concepts of and relationships to that government. This course will trace the history of the Presidency from the Founders' ideas about and experiences with executive power to the office's current state—with all its inherent paradoxes. I hope that, through this course, cadets will come to a deeper understanding of the Presidency's origins, development, powers, and limitations as well as the reasons behind the constant contest between the President and the Congress.

IS 313—Politics and the Media

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

The purpose of this course is to explore the evolution and role of the print and electronic media in American Politics as well as their relationship to the public, politicians and ultimately public policy. In doing so, the course will assess the media impact on government, policy making, election campaigning and the prospects for political deliberation. The course will pay special attention to the portrayal of political issues, candidates and political themes in popular culture including film, television, radio, political cartoons, music, and social media.

IS 320—National Security Policy

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Consideration of the formulation and conduct of United States defense and foreign policy with special attention to the key institutions involved in the decision-making process in this field. Recommended for NROTC cadets.

IS 321—International Political Economy

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Provides students with a basic understanding of the nature and dynamics of contemporary international political economy (IPE). Politics and economics have often been separate fields of study with different core concepts. The former typically centers on power and the latter markets. However, the nature of international relations demands that we understand the interaction of politics (power) and economics (markets). This course will examine a broad range of substantive issues (trade relations, financial and monetary policy, economic integration, and economic development), as well as theoretical debates in IPE. Prerequisite(s): IS 220 or IS 230

IS 322—Intelligence and Policy

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

The history and practice of intelligence with special emphasis on the relationship to the political policy process. The focus is on the U.S. intelligence experience since WWII, although some attention is given to the broader comparative context.

IS 326—U.S.—Soviet Relations during the Cold War

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

The course examine the U.S. and Soviet outlooks on the world, the origins of the Cold War, the role of ideology and power rivalry in the relationship, Bi-Polar myth and reality, selected issues of crisis management and alliance maintenance, strategic doctrine and approaches to arms control, how the Cold War ended. Not a comprehensive chronological history but issue-oriented case studies of policies and events.

IS 328—Multinational Peacekeeping

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

The purpose of this course is to explore the theory and practice of multilateral peace operations and humanitarian intervention as they relate to the principles and practice of international law in world politics. The course covers the origin and evolution of peacekeeping, peace enforcement, and post-conflict peace building; legal and ethical issues surrounding peace operations; and debates over peace operations doctrine and strategy. Specifically the course will identify and explain significant events in the history of international relations, including the Treaty of Westphalia, the European balance of power system prior to World War I, the world wars, colonialism and the Cold War.

The course will consider criteria for evaluation of peace operations, causes of peace operations success and failure, and problems of managing and coordinating actors involved in peace operations. The course will recognize the dynamic nature of international politics and evaluate the contemporary challenges to the traditional state-centric approach posed by non-state actors, including international organizations, social movements, multinational corporations and individuals. The course will identify and examine specific cases of peacekeeping and peace enforcement and will consider the role of peace operations in the promotion of international order, institutions of global and regional governance, especially the United Nations and explore the structure and functioning of significant international organizations, including the United Nations, the European Union, NATO, the International Monetary Fund, World Bank and World Trade Organization.

IS 329—Counterinsurgency

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course will concentrate on: a study of select counterinsurgencies using historical pattern analysis. Instructor will present a selection of various insurgencies and students will research and present on the following topics: American Revolution: Colonial insurgents against British army; Insurgency and Guerrilla warfare in U.S. Civil War; U.S and Counterinsurgency in the Philippines, 1899-1902; The Boer War: The Second War (1899-1902); British Malayan Emergency (1948-1960); Irish Republican Army vs British Army; Nepal : Maoist Insurgency. (1996-present); Colombia : FARC insurgency; and Overview of Turkish/Kurdish insurgency problem. Using historical study and pattern analysis of insurgent and counterinsurgent strategies, upon completion of the class, we will hopefully have an answer for the question—Will current U.S. counterinsurgency strategies in Afghanistan work?

IS 330—Politics in Western Europe

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An examination of the political systems and the domestic, foreign and defense policies of the United Kingdom, France, Germany, selected smaller Western European nations, and Canada. Attention will be paid to the new role of NATO, European unification, and the ways in which Western Europe and Canada deal with the United States.

IS 331—Politics in Russia and Eastern Europe

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An examination of the political systems and the domestic, foreign and defense policies of Russia and the nations of the former Soviet Union and Eastern Europe. Attention is given to the consequences of Marxist-Leninist theory and to the problems of transforming former communist systems.

IS 332X—Politics in East Asia

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An examination of the political systems and foreign relations of Japan, China, Korea, and Taiwan. Emphasis is placed on relations with other nations in the region, and with the United States. Particular attention is paid to the growing importance these nations have in the international economic system. Civilizations and Cultures (X)

IS 333—Politics in Southeast Asia

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An examination of the political systems and the domestic, foreign and defense policies of the countries of Southeast Asia including: Brunei, Burma, Cambodia, Indonesia, Laos, Malaysia, Philippines, Singapore, Thailand, and Vietnam. The course also focuses on the role of ASEAN, the Association of Southeast Asian Nations and the impact of outside powers on the region.

IS 334X—Politics of Central Asia

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

By exploring the politics and societies of this important, but little understood, region, we will seek to develop a nuanced understanding of how international dynamics continue to shape the states of this region and also how forces emanating from within Central Asia impact the international system. Additionally, in this course students will analytically explore a variety of political and societal phenomena present in the region and beyond. Amongst the phenomena we will examine include: the politics of oil and gas pipelines, state-building and nationalism, secession and civil war, Islamism, democratization and authoritarian state consolidation. Civilizations and Cultures (X)

IS 335—Politics in Latin America

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An examination of contemporary political systems and their development in Latin America. Focuses on contemporary structures and processes of politics in the major Latin American Republics. Normally offered Spring Semester of odd-numbered years.

IS 336WX—Politics in China

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An overview of the political system of China in the post-Mao era. Starting with a discussion of Deng Xiaoping's rise to power, students will discuss the popular desire for democracy and the failed attempts at establishing a more politically accountable government. This class will also detail the liberal economic policies that fostered the dramatic growth of China's economy well into the 21st century. Additionally, students will focus on the evolution of security concerns and civil-military relations on the mainland, as well as issues between China and other actors across the world, notably the United States, Taiwan, Japan, and the developing countries of Africa and Asia. Note: Writing Intensive (W) and Civilizations & Cultures Course (X).

IS 337WX—Post Soviet Politics

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course is an introduction to the politics of the post-Soviet states with a specific emphasis on the politics of the Russian Federation (Russia). It is divided into the following five unequal parts: 1) Authoritarian Persistence; 2) Soviet Collapse; 3) Post-Soviet State-building; 4) Political Institutions and Behavior; 5) The Politics of the Economic Transition. Each of the five parts of the course investigates key issues in the study of post-Soviet politics as well as important

concerns for the political science sub-discipline of comparative politics more broadly. Note: Writing Intensive (W) and Civilizations & Cultures Course (X).

IS 338—Politics of India and the Subcontinent

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

As South Asia is home to more than one-fifth of the world's population, understanding its political landscape is of vital importance. South Asia is characterized by states that vary greatly in governmental structures and levels of economic development. The goal of this class is to understand these differences by closely examining the political framework of and the dynamics between the major regional players (India, Pakistan, Bangladesh, and Sri Lanka). We will explore the role and impact of political institutions, parties and political leaders, political participation and interest articulation as well as modernization and economic development. While learning about each state's political system in a comparative fashion, we will also explore relations between the different states.

IS 339—Digital Media and South Asian Politics

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Digital media and information technologies enable the masses to express their views and to enjoy direct participation in various political and public decision-making arenas. This course will explore the relationship between technology, media and society in South Asia and how new forms of social connections and participatory technology impact political behavior in the region. We will investigate the significance of various new media technologies by reflecting on theoretical and social scientific perspectives to advance our understanding of South Asian politics. While on the one hand interactive digital environments provide new participatory spaces, digital information technologies can also open up new areas of concerns, such as loss of privacy, surveillance, cybersecurity, and withdrawal from the offline political sphere.

IS 340—Political Theory

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A study of the writings of key Western political thinkers from Socrates to the twentieth century. The objective of this course is to elucidate the origins and basic assumptions of contemporary political ideas and ideologies.

IS 350—Criminal Law

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course presents a general survey of substantive criminal law, that is the principles, theories, and important legal decisions defining criminal offenses and defenses. Substantive criminal law examines the conduct of the defendant. Time permitting; we may also delve into some procedural criminal law, which is based on the U.S. Supreme Court's interpretations of the Bill of Rights. Criminal procedure evaluates the conduct of police and prosecutors. The course will utilize the casebook method of teaching favored by most law school courses.

IS 351—Constitutional Law

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course presents a survey of the guiding principles of American Constitutional Law, with particular emphasis on landmark decisions of the United States Supreme Court interpreting the Bill of Rights. The class begins with the establishment of judicial review in 1803, but moves rapidly to the Court's twentieth century jurisprudence. A substantial area of focus is constitutional criminal procedure—the Fourth, Fifth and Sixth Amendment decisions evaluating police conduct including methods of search and seizure and the interrogation of criminal suspects. Additional main topics include freedom of speech, religion, and the press according to the First Amendment, and Due Process of law and Equal Protection of the laws under the Fifth and Fourteenth Amendments. The course uses the casebook method of teaching favored by most law school courses. Class participation is important.

IS 352—International Law

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course examines international law and its relationship to the practice of international politics. The course examines the sources of international law and its relationship to law within the state; the major players—the state, the UN and other IGO's, natural and corporate individuals–and their attributes and capabilities. Some consideration is given to processes: diplomacy, treaties, arbitration, and adjudication. The final third of the course considers selected contemporary problem areas: the use of force, economic issues, protection of human rights, the environment. Two continuing themes throughout the course are: (1) how international law changes over time in response to changes in the international system; (2) how international law accommodates both justifiable claims and power realities.

IS 370—Intermediate Special Seminar

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Intermediate-level elective seminars on special topics in politics as suggested from time to time by members of the faculty or groups of cadets.

IS 390—Independent Study

Research and writing on an approved intermediate (300) level topic, under the direction of International Studies faculty. Prerequisite(s): Permission of the Department Head.

IS 395—Public Opinion Research in Europe

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

In this class, we will discuss the efforts of social scientists to understand popular opinion through national-level polls. Students will learn the techniques by which samples are taken from populations, and the tradeoffs to approaches. So, too, will they learn about issues surrounding question wording, conceptual reliability, and external validity. The class will culminate in a research project where students will collaborate with the professor to model explanations for support for greater cohesion among the EU countries, particularly older and newer members. Students, themselves, will conduct reviews of the literature before contributing to a test of the various arguments made by previous authors using Eurobarometer public opinion data. Site visits to government entities, such as the European Parliament, will provide context for these analyses.

IS 401W—International Studies Seminar

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

The capstone course for the International Studies curriculum. The course focuses on problems of United States foreign and defense policy. The course requires substantial written and oral work. Open only to first class International Studies majors. International Studies minors may be admitted with the permission of the department head on a space available basis. Writing Intensive (W)

IS 421X—The Politics of Terrorism

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

The Politics of Terrorism is a three-credit course that focuses generally on the role of terrorist violence in the modern world. The two central goals of the course are to provide cadets with an opportunity to study the historical use of political terror and to encourage cadets to think of terrorist activity not as the work of the mad, but of self-interested and calculating political actors. After an introduction that includes a definition of terrorism and an exploration of its geneses, the course focuses on the rational and psychological aspects of the individual terrorist, terror types, strategies, and tactics, and the difficult task of counterterrorism. The final part of the course illustrates and highlights each of these aspects by examining cases culled from recent history, including the Zionist-British conflict over Palestine in the 1940s, the Algerian drive for independence in the 1950s, and the ongoing standoff between the USA and Islamic fundamentalist terrorists. Note: Civilizations & Cultures Course (X).

IS 422—Domestic Politics and International Conflict

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

How does domestic politics affect the ability and willingness of states to fight wars abroad, and how do wars affect domestic politics? Surveying historical and contemporary scholarship, this course will familiarize students with various theories about these relationships. General topics to be covered include (a) the influence of institutional characteristics—such as general regime type, the separation of powers, and procedural and election rules—on war initiation and war outcomes; (b) the peculiar relationship between public opinion and war; and (c) how these and other factors impact the political strategies of war-time leaders, domestic opposition groups, and international opponents. In addition to applying these theories and lessons to various historical cases, the course will afford students the opportunity to engage in interactive exercises that illustrate the complex linkages between the domestic and the international.

IS 423W—Studies in Grand Strategy

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

IS 423W examines the theory and practice of grand strategy in an international context using both historical and contemporary case studies. Initial attention is given to classical cases including the Peloponnesian War and Bismarck as grand strategist. Consideration then shifts to an examination of grand strategy in the twentieth century including cases related to the two world wars, the interwar period, and the Cold War. The course concludes with an examination of two case studies of a more contemporary nature. A major research paper is required. Note: IS 423W is jointly-listed as HNL 375W, Studies in Grand Strategy. Writing Intensive (W)

IS 424WX—Regional Politics and Powers

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course examines regional sub-systems in international politics, with a specific focus on regional conflict, security, and integration. A primary focus of the course will be the behavior of regional powers—those states with sufficient capabilities, willingness, and status to shape politics within their regions—and whether they provide the stability necessary for peace or facilitate violent conflict. As an extension of these peaceful or conflictual patterns of political interaction is the formation of formal intergovernmental organizations, such as the Arab League or the European Union. Careful attention will also be paid to those regional subsystems lacking a regional power, as is the case in the contemporary Middle East. Finally, students will relate regional politics to the broader international order within which it is nested, examining how international system dynamics, such as competition between major powers, shape the regional level. Note: Writing Intensive (W) and Civilizations & Cultures Course (X).

IS 425W—Theories of War and Peace

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course provides cadets with an introduction to the scientific study of international conflict. Simply put, the course examines existing empirical evidence to answer the question "What do we know about war?" Cadets will begin by engaging the existing dominant theories of international conflict, broadly defined, and conclude in reviewing the relationship between different variables and conflict onset, including, but not limited to, relative power, democracy, rivalry, status, and dissatisfaction. Throughout the course, students will be required to think critically about existing approaches, generate their own ideas about the potential correlates of war, and relate how the scientifically generated empirical findings from the course have practical applicability to American foreign policy. Note: Writing Intensive Course (W).

IS 426X—Religion and War

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

What is the relationship between religion and political violence, and how it has evolved through modern history? Given that religion preaches peace, why does it seem to be inherently prone to violence? How is religion used to mobilize popular support for secular or material causes? We will address these questions and others using theories and concepts in political science (such as those dealing with social mobilization, collective rationality and irrationality, and group psychology), as well as historical treatments of "holy war," including the Crusades, the shifting Islamic conception of jihad, and modern-day politico-religious terrorism. Note: Civilizations & Cultures Course (X).

IS 427—Transatlantic Security 1941-2015

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

The course will consider in turn: Security and security policy issues (basics): meanings of the term security, complex security, security organizations and architecture, today's security challenges US-European issues: historical background, common institutions and efforts, main differences of the security policy perceptions, NATO-EU issues: historical background, institutions, NATO's development after the cold war, relationship before 9/11, relationship after 9/11, 2003 Iraq War, possible future, differences between security perceptions. Case studies: Middle East, Balkan, International Terrorism, Missile Defense, Climate Change, etc.

IS 428—US-China Relations

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

The most consequential international relationship in the 21st century is, and will continue to be, that between the United States of America and the People's Republic of China. Understanding the nature of this relationship (whether it is cooperative, competitive, or something in between) is of the utmost importance, as is the complex and difficult task of explaining why the relationship is the way it is. This class is dedicated to both tasks. Cadets will examine Sino-American relations along different dimensions: military-security, regional-security and alliances, economic, domestic political, and grand strategic. In terms of its theoretical orientation, cadets will consider prominent realist, liberal, and constructivist explanations of Sino-American relations from 1949 to the present.

IS 429—Strategy and Cybersecurity

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

While cyberspace is a relatively new domain, it is fundamentally an arena for strategic interaction. As such, the principles, concepts, and mechanisms familiar to students and practitioners of strategy can be usefully employed to better understand the causes of conflict and stability in cyberspace. In this course, we will take seriously the idea that strategic challenges and logics transcend time and space. In so doing, we not only examine cyberpower, the cyber offense-defense balance, cybersecurity dilemma, and coercion in cyberspace, but also how scholars have employed those concepts and analytical frameworks (that is, without the modifier "cyber") to explicate other forms of conflicts well before the advent of the cyber age.

IS 430W—Democracy and Elections

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An explanation of principles of democracy and how theory is applied on the ground in different countries. Students will learn about the meaning of democracy, how scholars define it, and how different forms are implemented. They will review the processes by which democracies of one type transition into another, or how authoritarian regimes morph into democratic systems. They will investigate how institutions vary across countries, including the roles of the executive, legislature, and judiciary. Chiefly, students will spend time reviewing how different states translate popular opinion into government action, i.e. elections. This will include examples of majoritarian electoral systems used by the United States, Australia, and the United Kingdom, proportional systems used by Ireland, Brazil, and Iraq, and hybrid systems, found in Taiwan, Japan, New Zealand, and Germany. The course will conclude with a discussion of which systems work better than others and whether certain countries would profit from a change in democratic system type. Writing Intensive (W)

IS 431W—Riots, Protests, Social Movements

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Social movements and protest have become a part of the political landscape. This class explores the dynamics of political contention, from collective looting to revolution, involving tactics that go from reform-mongering to foot dragging to collective violence, and targeting power-holders whose authority may or may not be formally institutionalized. We will review the development of the scholarship in contentious politics, including its theoretical foundations,

approaches, and applications. Comparisons will be made between different approaches to the same event and between different types of political contention. Writing Intensive Course.

IS 434WX—Authoritarianism

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Authoritarian rule has been the norm throughout human history. Despite recent waves of democratization, today roughly half of the global population lives under non-democratic regimes. In this course, we will investigate the politics of authoritarian regimes. We will pay particular attention to where and why these regimes are established, what sustains them, and when and how they decline. Note: Writing Intensive (W) and Civilizations & Cultures Course (X).

IS 435WX—Comparative Political Economy

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

In this course, we will evaluate the important interaction of economic and political systems across several countries and systems. We will review how the economic framework of a given state impacts the workings of the political process. In addition, we will learn how political decisions often impact the growth and development of markets. Examples will be drawn from a number of different countries, from the United Kingdom, Poland, and Spain to China and Japan. We will place special emphasis on the oft-debated link between capitalism and democracy; we will also study the tension between political ideology and economic growth, as well as the influence of business cycles and perceptions of economic performance on voter preference during elections. Note: Writing Intensive (W) & Civilizations and Cultures (X)

IS 438WX—Ethnic Conflict and Politics

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

The course is designed to provide cadets with an overview of the relationship between ethnicity and politics. We will seek to understand both what ethnic groups are and why they often seem to be so important in a wide variety of political systems across the globe. We will pay special attention to understanding the causes of ethnic conflict. We will also spend considerable time examining various possible means of fostering inner-ethnic peace. Attention will also be paid to questions regarding the effect of ethnicity on democratic politics, economic development, and public policies. Our approach to this topic will be broadly comparative; we will draw on cases from Africa, Europe, Latin America, and Asia. Note: Writing Intensive (W) and Civilizations & Cultures Course (X).

IS 439—Authoritarian Environmentalism in China

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

In this course, we evaluate the contention that the People's Republic of China centralized system of governance is best suited to address the environmental challenges of the twenty-first century. Proponents of "authoritarian environmentalism" contend that the leaders of a political system, insulated from popular will, possess the ability to make unilateral decisions that are needed to combat long-term issues, such as air and water pollution, and implement reforms. As we progress through this course, however, we will find that there are numerous scholars who call this argument into question. We proceed by taking stock of the environmental problems that China faces, before learning about the legal and political frameworks through which policy is made and enforced. Next, we observe how the central and local governments in China confront environmental issues to varying degrees of success. We also consider the different challenges urban and rural residents face, and the impetus for "green" movements that have emerged over the last decade. Finally, we learn of the external forces that have influenced the path China has taken, before concluding with extensive discussions of student research. All told, China's leaders may have an understanding of what environmental threats they face, but they are frequently stymied in how they approach addressing these problems; a failure to curb the dangers of environmental degradation can not only put citizen lives in jeopardy but also undermine the Chinese Communist Party's legitimacy as the ruling power and moral force at the helm of the Chinese state.

IS 440—American Political Thought

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course will examine the competing ideals at the center of the American political tradition and how they have interacted and evolved over time. Students will not only gain a clearer understanding of American intellectual history and how the great debates over the nature of the American regime have in fact played out, but will also consider the merits and demerits of the various claims being made. Readings will include Federalist and Antifederalist writings, Thomas Jefferson, Alexis de Tocqueville, John C. Calhoun, Abraham Lincoln, Edward Bellamy, John Dewey, Herbert Croly, and others.

IS 441—Conservative Political Thought

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An examination of competing strains of thinking within conservatism organized around a series of debates. Some of the themes that will be covered include: the definition of conservatism, America as a propositional nation vs. a common culture, the aims of U.S. foreign policy, Lincoln's America vs. the Old South, aristocratic vs. populist impulses, theories of jurisprudence, the purpose of the economic order, and the meaning of progress.

IS 442—Law, Morality, and Power

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course will examine the nature of law and the role that morality and power play in constituting the law. Is law fundamentally moral, discoverable by reason and necessarily conducive to the common good of society? Or is law nothing more than the commands issued by whoever has the most power? Do citizens have a moral obligation to obey the law, or are such claims, themselves, expressions of power? When judges interpret the law, do they too have obligations, or must we simply expect them to act as agents of a particular social, political, and economic group? These and other questions related to a deeper understanding of law and legal systems will be the focus of this course.

IS 443—The Morality of War

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course will examine the criteria that are used to make determinations regarding the justice and injustice of warfare. Both contemporary and classical philosophers will be examined, and a variety of historical examples will be considered so that students can acquire experience in applying these criteria. Specific questions to be considered include: What are the just purposes for which one may go to war? What is the manner in which a just war must be fought? Who has the authority to make such determinations? Must one discriminate between combatants and non-combatants? Can war be morally distinguished from other types of conflict, such as terrorism? These and other related questions within the just war tradition will be explored throughout the term.

IS 459—The Law of International Armed Conflict

Lecture Hours: 1 **Lab Hours:** 0 **Credit Hours:** 1

This course provides students with a general understanding of the international legal regulation of armed conflict—including humanitarian law and international criminal law. The aim of the course is to give the students an understanding of the legal challenges of current and future-armed conflicts, as well as enable them to critically analyze and evaluate cases using both legal and political analysis. This will be achieved from specific readings and class discussion and the application of several case study scenarios where the students will be required to analyze the issue at hand and recommend a solution using their understanding of international law as it applies to armed conflict. Note: Students will not be taught the use of the law, but rather how and where to find the law and how to apply it to the scenarios presented. This course will be open to those students selected to compete in the International Competition of the Law of Armed Conflict in San Remo, Italy

IS 460W—Research Design for Political Science
Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course focuses on philosophies of and approaches to political science for facilitating cadets' research objectives. The two central goals of the course are (a) to introduce cadets to the methods traditionally used to design, conduct, and report political science research; and (b) to allow cadets to apply these methods to their individual research questions. Cadets will frame research questions about politics, develop rigorous theories and hypotheses about politics, identify reasonable measures to test relationships, collect political data, develop a research design on a topic of their choosing that is acceptable by professional political scientific standards, and publicly present this research design. Prerequisite(s): ERH 102 & IS 201 with a minimum grade of C.

IS 470—Advanced Special Seminar
Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Upper-division elective seminars on special topics in politics as suggested from time to time by members of the faculty or groups of cadets.

IS 479—Advanced Special Seminar
Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Upper-division elective seminars on special topics in politics as suggested from time to time by members of the faculty or groups of cadets.

IS 485—National Security Minor Capstone
Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

First class cadets pursuing the National Security Minor or other cadets approved by the professor will participate in this seminar styled course. The discussions will be built largely around the ideas and research of the cadets themselves. IS Faculty will be invited to discuss their on-going research and to share experiences and observations on successful and often unsuccessful research efforts. The course may include a discussion of the current security issues driving debates in the broader national security community.

IS 490—Independent Study
Lecture Hours: 3 **Lab Hours:** 2 **Credit Hours:** 3

Research and writing of a substantial paper on an approved topic, under the direction of International Studies faculty. Prerequisite(s): Permission of the department head.

IS 491—Reading for IS Honors
Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Cadets will develop an agenda of inquiry for the purpose of writing an original piece of political science research. To this end, cadets must, under the supervision of a faculty sponsor: choose an appropriate general topic; conduct in-depth reading in a selected subfield of political science; select an appropriate method of inquiry; and present and defend a formal research proposal. Prerequisite(s): Admission to the IS Honors Program.

IS 492—Writing for IS Honors
Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Cadets will write an original piece of political science research based on the preparation undertaken in IS 491. Specific requirements include: the completion of theoretical arguments or the execution of empirical hypothesis testing; scheduled draft and final paper submissions (to be accomplished in close consultation with a faculty sponsor); and a public oral presentation of the completed project. The successful completion of this course will result in the conferral of Department Honors. Prerequisite(s): Grade of B or better in IS 491.

IS 493—International Studies Senior Thesis
Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Research and writing of a substantial paper under supervision of a faculty sponsor. Oral examination by an ad hoc faculty committee. Open only to international studies majors. Prerequisite(s): Grade of B or better in IS 491 and IS 492.

Leadership Studies and Career Development

Department of Psychology

Department Head: Col. Gire

LS 350—Leadership and Career Development I
Lecture Hours: 0 **Lab Hours:** 1 **Credit Hours:** 0

Required for those cadets not being commissioned in the Armed Forces and who are enrolled in AS 303, MS 309, NS 308, or NS 303. The class focuses on knowing yourself, career discovery and planning, resume writing, and personal development.

LS 351—Leadership and Career Development II
Lecture Hours: 0 **Lab Hours:** 1 **Credit Hours:** 0

Required for those cadets not being commissioned in the Armed Forces, and who are enrolled in AS 304, MS 310, NS 205, or NS 304. The class focuses on career preparation and research. networking skills, critical thinking, time management, and values and ethics in the workplace.

LS 450—Leadership and Career Development III
Lecture Hours: 0 **Lab Hours:** 1 **Credit Hours:** 0

Required for those cadets not being commissioned in the Armed Forces, and who are enrolled in AS 403, MS 409, or NS 408. The class focuses on job search and graduate school admission activities, business correspondence, building a portfolio, recruitment, advanced interviewing skills, dressing for success, business etiquette, and using the internet in the job search.

LS 451—Leadership and Career Development IV
Lecture Hours: 0 **Lab Hours:** 1 **Credit Hours:** 0

Required for those cadets not being commissioned in the Armed Forces, and who are enrolled in AS 404, MS 410, NS 402, or NS 404. The class focuses on post-VMI career transition, salary negotiation, business ethics, employment law, income tax preparation, basic money management and investing for the future, 401 (k) plans, starting your own business, and how much insurance is enough.

Mechanical Engineering

Department of Mechanical Engineering

Department Head: Col. Hardin

Requirements for a major in mechanical engineering are specified in Mechanical Engineering.

ME 105—Introduction to Mechanical Engineering

Lecture Hours: 0 **Lab Hours:** 2 **Credit Hours:** 1

Introduction to the diverse career opportunities available in Mechanical Engineering and to the ME curriculum; discussion of participation in study abroad, internships, and undergraduate research and of specific academic skills required for success; and hands-on technical projects in both the Machine Design and Energy areas.

ME 109—CAD Applications and Solid Modeling

Lecture Hours: 0 **Lab Hours:** 2 **Credit Hours:** 1

Selected CAD applications such as Orothographic and Isometric Design. Use of CAD to solve engineering applications and Solid Modeling Applications.

ME 110—Materials

Lecture Hours: 2 **Lab Hours:** 2 **Credit Hours:** 3

The atomic structure and microstructure of engineering materials. Classroom and laboratory analysis of the physical properties of metallic and non-metallic compounds; ferrous, nonferrous, ceramic, polymer, and composite materials. Material stress-strain diagrams, fatigue, creep, phase diagrams and heat treatment diagrams will be emphasized.

ME 201—Statics

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Vector and scalar methods in the composition and resolution of forces; moments of forces; equilibrium in two or three dimensions; simple structures including trusses and frames; shear and moment in beams; distributed loads; friction; centroids and centers of gravity. Corequisite(s): MA 124 unless previously completed.

ME 203—Programming Tools for Mechanical Engineers

Lecture Hours: 1 **Lab Hours:** 2 **Credit Hours:** 2

Programming fundamentals and introductory instruction in the use of mathematical application software. Focus will be upon problem solving techniques and logical solution development.

ME 206—Solid Mechanics

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A study of the behavior of non-rigid bodies when subjected to external tension, compression, bending, torsional loads, or combination of these loads. Development of mathematical expressions that relate external loads, member properties, and internal stresses, strains, and deflections. Includes elastic and plastic stress theory. Prerequisite(s): MA 124, ME 109, ME 110 and a grade of C or higher in ME 201.

ME 243—ME Design Competition Participation

Lecture Hours: 0 **Lab Hours:** 1 **Credit Hours:** 0.5

Participation in a student design team competition team for underclassmen. Prerequisite(s): Permission of a team adviser.

ME 244—ME Design Competition Participation

Lecture Hours: 0 **Lab Hours:** 1 **Credit Hours:** 0.5

Participation in a student design team competition team for underclassmen. Prerequisite(s): Permission of a team adviser.

ME 255—Summer Research

Lecture Hours: 0 **Lab Hours:** 2-6 **Credit Hours:** 1-3

Offered to mechanical engineering cadets engaged in summer research. Prerequisite(s): Permission of department head.

ME 256—Summer Research

Lecture Hours: 0 **Lab Hours:** 2-6 **Credit Hours:** 1-3

Offered to mechanical engineering cadets engaged in summer research. Prerequisite(s): Permission of department head.

ME 302—Dynamics

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Vector and scalar methods in kinematics, including absolute and relative motion of particles and rigid bodies; kinetics, with solutions of rigid bodies by the methods of force, mass and acceleration, work and energy, and impulse and momentum. Prerequisite(s): ME 201.

ME 311—Thermodynamics I

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A study of the first and second laws of thermodynamics; basic energy concepts; the properties of liquids and vapors including enthalpy and entropy; ideal gas concepts and relationships. Prerequisite(s): MA 124 and ME 203 Corequisite(s): ME 203

ME 313—Thermodynamics II

Lecture Hours: 3 Lab Hours: 1 Credit Hours: 3.5

Gas-vapor mixtures, psychrometry and air conditioning process; real and ideal power, refrigeration, heat pump, and air compression cycles; fuels and combustion processes; energy system design and computer applications; laboratory experience to reinforce theoretical concepts to include engineering team experience and report writing. Prerequisite(s): A grade of C or higher in ME 311.

ME 314—Fluid Mechanics

Lecture Hours: 3 **Lab Hours:** 1 **Credit Hours:** 3.5

Elementary mechanics of fluids. fluid properties; hydrostatics; fluid kinematics; equations of motion; energy equation; momentum principles; flow of liquids and gases in closed conduits; compressible flow; principles of dimensional analysis and dynamic similitude; laboratory experience to reinforce theoretical concepts to include engineering team experience and report writing. Prerequisite(s): MA 124, ME 201, ME 311.

ME 321—Dynamics of Machinery

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Application of kinematics and dynamics to the design of mechanical components. Analysis and synthesis of the relationship between machine forces and motions. Prerequisite(s): ME 302.

ME 322—Mechanical Analysis and Design

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Review of stress and stiffness analysis. Introduction to failure theories, fatigue, finite elements, and material selection as it pertains to design of machine elements. Prerequisite(s): A grade of C or higher in ME 206.

ME 325—Instrumentation Laboratory

Lecture Hours: 1 **Lab Hours:** 2 **Credit Hours:** 2

Measurement of temperature, pressure, flow, strain, stress, force, velocity and displacement. Interpretation of data curve fitting, statistics. Signal conditioning, digital data acquisition, data recording. Static and dynamic systems. Prerequisite(s): ERH 102 and ME 203.

ME 336—Heat and Mass Transfer

Lecture Hours: 3 **Lab Hours:** 1 **Credit Hours:** 3.5

Fundamental principles of heat transfer by conduction, convection, and radiation are examined. Provides an introduction to mass transfer. Contains elements of design of fins and composite walls. Finite difference techniques are introduced. Includes laboratory experience to reinforce theoretical concepts to include engineering team experience and report writing. Prerequisite(s): ME 311 and MA 311.

ME 342—Analysis and Control of Dynamic Systems

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Analysis of dynamic system in both the time and frequency domain, with application to the design of basic feedback control systems. Mechanical, electrical, thermal, and fluid systems are considered. Topics include transfer function determination, frequency response, error analysis, root locus techniques, stability analysis, linear and non-linear systems. Prerequisite(s): MA 311 and EE 351.

ME 343—ME Design Competition Participation

Lecture Hours: 0 **Lab Hours:** 1 **Credit Hours:** 0.5

Participation in a student design team competition team for underclassmen. Prerequisite(s): Permission of a team adviser.

ME 344—ME Design Competition Participation

Lecture Hours: 0 **Lab Hours:** 1 **Credit Hours:** 0.5

Participation in a student design team competition team for underclassmen. Prerequisite(s): Permission of a team adviser.

ME 350X—History of Technology

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A study, from both an historical and current perspective, of the role of technology in influencing both the development of distinctive cultural practices and the spread and globalization of specific cultures (western, eastern, and the Americas) in order to gain a better understanding of the cultural catalyst that technology has played in the past and may play in the future. Civilizations & Cultures (X)

ME 355—Summer Research

Lecture Hours: 0 **Lab Hours:** 2-6 **Credit Hours:** 1-3

Offered to mechanical engineering cadets engaged in summer research. Prerequisite(s): Permission of department head.

ME 356—Summer Research

Lecture Hours: 0 **Lab Hours:** 2-6 **Credit Hours:** 1-3

Offered to mechanical engineering cadets engaged in summer research. Prerequisite(s): Permission of department head.

ME 413—Aircraft Propulsion Systems

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Design and analysis of atmospheric propulsion engines and systems. Thermodynamics, combustion fundamentals, turbo machinery and the aerothermodynamics of inlets, diffusers, combustors, and nozzles as related to the design of gas turbine and rocket engines and components. Matching of propulsion system to vehicle requirements. Prerequisite(s): ME 313.

ME 414—Turbomachinery

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Theory and performance characteristics bearing on the design of fluid dynamic machines such as centrifugal and axial flow pumps, fans, compressors, and turbines. Prerequisite(s): ME 314 and ME 311.

ME 415—Flight Mechanics

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Properties of the earth's atmosphere. Aerodynamic parameters, generation of lift, airfoils and wing theory. Boundary layer, aerodynamic drag. Aircraft performance: climb, range and endurance. Introduction to stability and control. Prerequisite(s): 2nd class standing or higher.

ME 416—Fundamentals of Aerodynamics

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Introduction to differential analysis of fluid motion, incompressible external inviscid flow, incompressible external viscous flow, steady one-dimensional compressible flow: Fanno Line Flow, Rayleigh Line Flow, Normal Shocks. Prerequisite(s): ME 311 and ME 314.

ME 417—Aircraft Structural Analysis

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Introduction to the linear, static structural behavior relating to aircraft design. Classical methods of analysis will be applied to practical problems. Prerequisite(s): ME 201 and ME 206.

ME 418—Thermal Environment Engineering

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Analysis and synthesis of systems to produce control of the thermal environment of enclosures for human occupancy, processes of special equipment. Psychrometrics of air, heating and cooling load calculations, and systems design. Prerequisite(s): ME 311.

ME 419—Thermal-Fluid Systems Design

Lecture Hours: 3 **Lab Hours:** 2 **Credit Hours:** 4

Application of thermodynamics, fluid mechanics and heat transfer to energy conversion processes. Design of engines, heat exchangers, compressors, valves, fans, blowers, vessel design, and power and refrigeration cycles. Prerequisite(s): ME 313, ME 314, ME 336.

ME 420—Flight Mechanics II

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Continuation of ME 415 Flight Mechanics. Includes more advanced investigation of aerodynamic parameters, aircraft performance and dynamic behavior, and aircraft stability and control. This is a project-based course where models are developed using a variety of software tools. Prerequisite(s): ME 203, ME 342, & ME 415.

ME 425—Mechanical Design

Lecture Hours: 3 **Lab Hours:** 2 **Credit Hours:** 4

Design of mechanical components subject to static and fatigue loads. Practical design and applications of materials to power screws, fasteners, springs, bearings, gears, chains, and belts. Design of power transmissions. Introduction to the finite element method. Prerequisite(s): ME 322.

ME 427—Introduction to Automated Manufacturing Systems

Lecture Hours: 2 **Lab Hours:** 2 **Credit Hours:** 3

Introduction to computer-aided manufacturing. Familiarization with standard manufacturing processes. Study of commercial CNC programming languages, CNC mill operation and CNC lathe operation, and pick-and-place robots. Extensive hands-on-operation of robots, CNC units and machinery. Open-ended design of manufacturing processes and design for manufacturability. Prerequisite(s): ME 110 and ME 109.

ME 431—Power Plant Design

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

The production of power from the Rankine, Brayton, and combined cycles will be studied. Realistic cycles similar to those found in current use will be analyzed. Consideration will be given to economics, materials selection, and environmental concerns. Each cadet will perform an economic analysis on a cycle design. The use of nuclear energy as a source of thermal energy will be considered. Prerequisite(s): ME 313, ME 336, and ME 314.

ME 443—ME Design Competition

Lecture Hours: 1 **Lab Hours:** 4 **Credit Hours:** 3

The first semester of a two semester sequence. A cadet team will design and build a working device in order to compete in a national design competition. This first course is intended to be coupled with ME 444 in the spring semester. Prerequisite(s): Permission of department head.

ME 444W—Mechanical Engineering Design

Lecture Hours: 1 **Lab Hours:** 4 **Credit Hours:** 3

A full-semester team-project internship. Cadets in three-person teams serve as consultants to an industrial client. Emphasis on conducting a professional-level design study, and the preparation of a verbal, plus written, report to industry. Prerequisite(s): Take ME 419 or ME 425

ME 455—Summer Research

Lecture Hours: 0 **Lab Hours:** 2-6 **Credit Hours:** 1-3

Offered to mechanical engineering cadets engaged in summer research. Prerequisite(s): Permission of department head.

ME 456—Summer Research

Lecture Hours: 0 **Lab Hours:** 2-6 **Credit Hours:** 1-3

Offered to mechanical engineering cadets engaged in summer research. Prerequisite(s): Permission of department head.

ME 457—Seminar

Lecture Hours: 0 **Lab Hours:** 1 **Credit Hours:** 0.5

Weekly seminars will cover job placement, graduate schools, ethics, design safety and preparation for the Fundamentals of Engineering Exam. Oral and written reports on engineering ethics case studies are required.

ME 458—Seminar

Lecture Hours: 1 **Lab Hours:** 0 **Credit Hours:** 0

Weekly seminars will provide preparation for the spring Fundamentals of Engineering Exam.

ME 461—Independent Research

Lecture Hours: 0 **Lab Hours:** 2-6 **Credit Hours:** 1-3

Offered to mechanical engineering cadets engaged in research or thesis projects supervised by the faculty. Credits may be substituted for appropriate mechanical engineering courses offered in the regular session. Prerequisite(s): Permission of department head and faculty or senior thesis adviser.

ME 462—Independent Research

Lecture Hours: 0 **Lab Hours:** 2-6 **Credit Hours:** 1-3

Offered to mechanical engineering cadets engaged in research or thesis projects supervised by the faculty. Credits may be substituted for appropriate mechanical engineering courses offered in the regular session. Prerequisite(s): Permission of department head and faculty or senior thesis adviser.

ME 480—Internal Combustion Engine

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A study of reciprocating internal combustion engines; basic thermodynamic principles, compression and spark ignition engines, fuels, combustion, emissions, mechanical design considerations. Prerequisite(s): ME 313

ME 481—Computational Modeling and Virtual Design

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Geometric and solid modeling for computational analysis; finite element and finite volume formulation of the conservation laws, system optimization and rapid prototyping. Focus in on designing a system, representing that system on the computer, and analyzing it using finite volume or finite element techniques. Emphasis is on the use of computer based tools for system and component design. Prerequisite(s): ME 109, ME 313, ME 314, ME 336 and ME 311.

ME 484—Fiber Reinforced Composite Materials

Lecture Hours: 2 **Lab Hours:** 2 **Credit Hours:** 3

This course is an introduction to the analysis and design of fiber-reinforced composite materials. The course centers upon a semester-long design project. As part of this project, cadet teams first conduct a literature search to determine types of fiber materials, matrix materials and manufacturing methods currently available and present their findings and project recommendations to the class. The analysis of material response to loading for both lamina and laminates is discussed. The cadets, working in teams, then analyze, design, and fabricate a fiber-reinforced structure. Prerequisite(s): ME 206.

ME 485—Advanced Mechanical Design

Lecture Hours: 2 **Lab Hours:** 2 **Credit Hours:** 3

Extended use of the finite element method in the design of mechanical elements. Optimization techniques in mechanical design, dimensional analysis and modeling, graphical and analytical synthesis of mechanisms, and selection of motors. There will be a semester long design. The student will have the opportunity to work on a project that includes many of the mechanical elements discussed in the previous course work. Prerequisite(s): ME 425

ME 486—Topics in Mechanical Engineering

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Special topics in mechanical engineering and related areas as suggested by members of the faculty and/or cadets. Subjects and content to be announced before the semester being taught. Prerequisite(s): Permission of instructor. When Offered: Offered as announced.

ME 490—Topics in Mechanical Engineering

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Special topics in mechanical engineering and related areas as suggested by members of the faculty and/or cadets. Subjects and content to be announced before the semester being taught. Prerequisite(s): Permission of instructor. When Offered: Offered as announced.

Modern Languages Internship (for All Languages)

Department of Modern Languages and Cultures

Department Head: Col. Sunnen

All cadets who enter with two or more entrance units in a modern foreign language are given placement tests and are placed in appropriate courses on the basis of the test results combined with their previous high school language coursework, and after consultation with the department head of modern languages.

A single year of a foreign language shall count toward meeting graduation requirements only when the cadet is studying a second language or is taking a language as an elective.

Cadets must demonstrate proficiency in ML 101 in order to be admitted into ML 102. They must, similarly, demonstrate proficiency in ML 102 before enrolling in ML 201, and in ML 201 before enrolling in ML 202/204. Proficiency in ML 202/204 is a prerequisite for admission to 300-level courses. Completion of two 300-level courses or their equivalent is expected before enrollment in any 400—level course. Once a cadet has completed work at the 202/204 level, he/she may not return to the elementary level course for credit.

Cadets who present four years of a high school language or demonstrate native or near-native language abilities may not enroll at the elementary level of that language. Such students will have the choice of enrolling either in the first semester intermediate level of that language or in the first semester elementary course of a different language.

ML 311—Modern Language and Culture Internship

Lecture Hours: 0 **Lab Hours:** 0 **Credit Hours:** 3

Cadets work as interns in a modern language and culture setting where the modern language they are studying is the principal tongue. Fields may include, but are not limited to, education, industry, government agencies, and non-government agencies. Cadet interns will be expected to submit interim progress reports and a final report, all written in the principal language. Under the guidance of a faculty sponsor, who may confer with the representative of the sponsoring organization, the cadet will decide on a suitable project worthy of academic credit. Prerequisite(s): open only to first and second class MC cadets; permission of the department head and the faculty sponsor; six hours of junior (300) level course work in the principal language, preferably composition and conversation.

ML 355—Summer Research in Modern Languages and Cultures

Lecture Hours: 0 **Lab Hours:** 0 **Credit Hours:** 3

The above sequence of four courses offers opportunities to qualified students for independent study and research into the national literatures and cultures of the Arabic-, Chinese-, French-, German-, and Spanish-speaking countries of the world. Under faculty supervision, the student will conduct research leading to the composition of one or more pieces of significant, original writing. Prerequisite(s): Permission of the department head and the faculty research adviser; a sound reading knowledge of the principal language; and the ability to synthesize material from original literary and secondary sources, some of which must be written in the principal language. Eligibility: students have completed at least 6 hours of composition/ writing intensive courses at the junior (300) level in the modern language.

ML 356—Summer Research in Modern Languages and Cultures

Lecture Hours: 0 **Lab Hours:** 0 **Credit Hours:** 4

The above sequence of four courses offers opportunities to qualified students for independent study and research into the national literatures and cultures of the Arabic-, Chinese-, French-, German-, and Spanish-speaking countries of the world. Under faculty supervision, the student will conduct research leading to the composition of one or more pieces of significant, original writing. Prerequisite(s): Permission of the department head and the faculty research adviser; a sound reading knowledge of the principal language; and the ability to synthesize material from original literary and secondary sources, some of which must be written in the principal language. Eligibility: students have completed at least 6 hours of composition/ writing intensive courses at the junior (300) level in the modern language.

ML 455—Summer Research in Modern Languages and Cultures

Lecture Hours: 0 **Lab Hours:** 0 **Credit Hours:** 5

The above sequence of four courses offers opportunities to qualified students for independent study and research into the national literatures and cultures of the Arabic-, Chinese-, French-, German-, and Spanish-speaking countries of the world. Under faculty supervision, the student will conduct research leading to the composition of one or more pieces of significant, original writing. Prerequisite(s): Permission of the department head and the faculty research adviser; a sound reading knowledge of the principal language; and the ability to synthesize material from original literary and secondary sources, some of which must be written in the principal language. Eligibility: students have completed at least 6 hours of composition/ writing intensive courses at the junior (300) level in the modern language.

ML 456—Summer Research in Modern Languages and Cultures

Lecture Hours: 0 **Lab Hours:** 0 **Credit Hours:** 6

The above sequence of four courses offers opportunities to qualified students for independent study and research into the national literatures and cultures of the Arabic-, Chinese-, French-, German-, and Spanish-speaking countries of the world. Under faculty supervision, the student will conduct research leading to the composition of one or more pieces of significant, original writing. Prerequisite(s): Permission of the department head and the faculty research adviser; a sound reading knowledge of the principal language; and the ability to synthesize material from original literary and secondary sources, some of which must be written in the principal language. Eligibility: students have completed at least 6 hours of composition/ writing intensive courses at the junior (300) level in the modern language.

ML 498—Reading for the Honors Thesis in Modern Languages and Cultures

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Cadets will establish a topic for their Honors Thesis with the supervision of a faculty adviser. They will outline the scope of the research, a method of approach and a bibliography of works to be read for the Thesis. The cadet will present the above to the faculty mentor for Departmental approval.

ML 499—Writing Course for the Honors Thesis in Modern Languages and Cultures

Lecture Hours: 0 **Lab Hours:** 0 **Credit Hours:** 3

The cadet will address the writing process for the Honors Thesis and establish a schedule of drafts for each chapter. The faculty mentor offers critiques of both method and argument. The project culminates in an oral defense which will be open to the public. Upon successful completion of the project, the cadet will receive Departmental Honors. Open only to Modern Language majors. Prerequisite(s): successful completion of ML 498.

Military Science

Department of Military Science

Department Head: Col. Wawrzyniak

Curriculum is delivered in accordance with applicable service regulation and instruction.

MS 109—Introduction to the Army & Critical Thinking

Credit Hours: 1

Orients cadets to information and competencies that are central to a commissioned officer's responsibilities in today's Army. Cadets will gain a basic understanding of the Army values and culture, officership and leadership skills. Cadets will also learn time management, health and physical fitness, critical thinking and basic military skills. Cadets will attend one field training exercise during the semester where they will focus on the practical application of the basic skills learned during the course. No lab associated with this course.

MS 110—Introduction to the Profession of Arms

Credit Hours: 1

Continues to build upon the skills learned in MS 109 with greater emphasis on the principles of ethical leadership. Cadets will continue to learning the basics of leadership in demanding tactical scenarios. They will practice and improve their basic military skills in marksmanship, map reading and land navigation and first aid. Cadets will attend one field training exercise during the semester where they will focus on the practical application of basic military skills, and the use of teamwork in conducting collective tasks. No lab associated with this course.

MS 209—Innovative Team Leadership

Credit Hours: 1

MS 209 explores the dimensions of creative and innovative tactical leadership strategies and styles by examining team dynamics and two historical leadership theories that form the basis of the Army leadership framework (trait and behavior theories). Cadets practice aspects of personal motivation and team building in the context of planning, executing and assessing team exercises and participating in Leadership Labs. Focus is on continued development of the knowledge of leadership values and attributes through an understanding of Army rank structure, and duties and basic aspects of land navigation and squad tactics. Case studies provide tangible context for learning the Soldier's Creed and Warrior Ethos as they apply in the Contemporary Operating Environment (COE). No lab associated with this course.

MS 210—Army Doctrine and Team Development

Credit Hours: 1

MS 210 introduces Cadets to Modern Army doctrine as well as leadership ethics and decision-making. The course highlights dimensions of team building and development. Further study of the theoretical basis of the Army leadership framework explores the dynamics of adaptive leadership in the context of military operations. Cadets develop greater self-awareness as they assess their own leadership styles and practice communication and team building skills. Practical exercises give insight into the importance and practice of teamwork and tactics in real-world scenarios. No lab associated with this course.

MS 309—Adaptive Team Leadership

Credit Hours: 2

This is the first course in the advanced MSL program, specifically designed to prepare cadets for their responsibilities as Army officers. Emphasis is placed on the practical application of leadership and the mastery of effective planning, organizational and communication skills within the framework of Army doctrine. Cadets will examine Army leadership case studies and models in the search for their own effective leadership style.

Cadets are required to read selected works on military and organizational leadership throughout the semester and must write short analytical essays. Corequisite(s): MS 319 for seeking/commissioning cadets, or LS 350 for non-commissioning cadets. Failure to take LS 350 with ROTC course will result in a grade of F in the ROTC course.

MS 310—Applied Team Leadership

Credit Hours: 2

Continues the lessons of MS 309, with greater emphasis on the principles of ethical leadership. Cadets will be exposed to more detailed information regarding the functions of Army commanders and staffs, and will learn about the duties and responsibilities of specific Army occupation branches. Through Army values and codified leadership dimensions, cadets will learn to practice ethical leadership in dealing with external challenges and with their own subordinates. Superior-subordinate relations and practical counseling techniques are integrated into leadership exercises. Cadets are required to read selected works on military organizational leadership throughout the semester and must write short analytical essays.

Corequisite(s): MS 320 for seeking/commissioning cadets, or LS 351 for non-commissioning cadets. Failure to take LS 351 with ROTC course will result in a grade of F in the ROTC course.

MS 319—Lab for MS 309

Credit Hours: 0

The MS Lab focuses on the practical application of the subjects taught in the classroom during MS 309. Cadets will meet rigorous leadership challenges, reinforced by consistent instructor evaluation and mentorship. Leadership exercises will include tactical scenarios as well as the development and delivery of small group instruction for other cadets. This extensive training program also includes physical fitness, marksmanship, land navigation, drill and ceremonies, mission planning and written and oral communication skills. Cadets are required to participate in one field training exercise each semester, in which they will practice both leadership and teamwork and demonstrate their tactical and technical proficiency. This laboratory course companions the MS 309 class, and all contracted cadets must take the appropriate lab section simultaneously with this class each semester (non-contracted cadets who do not seek a commission will enroll in LS 350).

MS 320—Lab for MS 310

Credit Hours: 0

The MS Lab focuses on the practical application of the subjects taught in the classroom during MS 310 . Cadets will meet rigorous leadership challenges, reinforced by consistent instructor evaluation and mentorship. Leadership exercises will include tactical scenarios as well as the development and delivery of small group instruction for other cadets. This extensive training program also includes physical-fitness, marksmanship, land navigation, drill and ceremonies, mission planning and written and oral communication skills. Cadets are required to participate in one field training exercise each semester, in which they will practice both leadership and teamwork and demonstrate their tactical and technical proficiency. This laboratory course companions the MS 310 class, and all contracted cadets must take the appropriate lab section simultaneously with those classes each semester (non-contracted cadets who do not seek a commission will enroll in LS 351).

MS 409—Mission Command and the Army Profession

Credit Hours: 2

This course begins the cadet's transition to commissioned officer. Cadets will receive information that enables them to make sound career decisions as they prepare for accession. The training emphasis moves from the individual and squad level to the platoon level. Cadets

will gain specific knowledge and skills that they will need as professional officers, including training and maintenance management, subordinate counseling and development, Army staff operation and Military Justice. Corequisite(s): MS 419 for seeking/commissioning cadets, or LS 450 for non-commissioning cadets. Failure to take LS 450 with ROTC course will result in a grade of F in the ROTC course.

MS 410—Mission Command and the Company Grade Officer

Credit Hours: 2

This course continues the lessons of MS 409 and completes the transition from cadet to commissioned officer. Cadets will continue to learn the specific management skills they will need as professional officers. Special emphasis is give to "life skills" that cadets will need as young lieutenants, such as personal financial management, moving, housing and orientation to Army pay and benefits. Cadets will also become familiar with current Army operations worldwide. Corequisite(s): MS 420 for seeking/commissioning cadets, or LS 451 for non-commissioning cadets. Failure to take LS 451 with ROTC course will result in a grade of F in the course.

MS 419—Advanced MS Lab for MS 409

Credit Hours: 0

The Advanced MS Lab focuses on the practical application of the subjects taught in the classroom during MS 409. Emphasis is on the practical knowledge and skills that cadets will need as commissioned officers and Army platoon leaders. Cadets will practice training management and subordinate development through regular interaction with underclass MS cadets. They will have numerous opportunities to exercise collective leadership reinforced by consistent instructor mentorship. Through collective training, they will also maintain their basic military skills throughout the year. Cadets are required to participate in one field training exercise each semester, in which they will play an active role in planning and conducting training for all MS cadets. These laboratory courses are companions to the MS 409 classes, and all contracted cadets must take the appropriate lab section simultaneously with those classes each semester. Prerequisite(s): Completion of Cadet Leaders Course (CLC) required for enrollment.

MS 420—Advanced MS Lab for MS 410

Credit Hours: 0

The Advanced MS Lab focuses on the practical application of the subjects taught in the classroom during MS 410 . Emphasis is on the practical knowledge and skills that cadets will need as commissioned officers and Army platoon leaders. Cadets will practice training management and subordinate development through regular interaction with underclass MS cadets. They will have numerous opportunities to exercise collective leadership reinforced by consistent instructor mentorship. Through collective training, they will also maintain their basic military skills throughout the year. Cadets are required to participate in one field training exercise each semester, in which they will play an active role in planning and conducting training for all MS cadets. This laboratory course companions the 410 class, and all contracted cadets must take the appropriate lab section

simultaneously with those classes each semester (non-commissioning cadets will enroll in LS 451). Prerequisite(s): Completion of Cadet Leaders Course (CLC) required for enrollment.

MS 429—Adaptive Team Leadership

Credit Hours: 2

This is the first course in the advanced MSL program, specifically designed to prepare cadets for the responsibilities as Army officers. Emphasis is placed on the practical application of leadership and the mastery of effective planning, organizational and communication skills within the framework of Army doctrine. Cadets will examine Army leadership case studies and models in the search for their own effective leadership style.

Cadets are required to read selected works on military and organizational leadership throughout the semester and must write short analytical essays. Note: Instructor approval required. This course is the equivalent of MS 309. Corequisite(s): MS 439

MS 430—Applied Team Leadership

Credit Hours: 2

Continues the lessons of MS 429, with greater emphasis on the principles of ethical leadership. Cadets will be exposed to more detailed information regarding the functions of Army commanders and staffs, and will learn about the duties and responsibilities of specific Army occupation branches. Through Army values and codified leadership dimensions, cadets will learn to practice ethical leadership in dealing with external challenges and with their own subordinates. Superior-subordinate relations and practical counseling techniques are integrated into leadership exercises. Cadets are required to read selected works on military organizational leadership throughout the semester and must write short analytical essays. Note: Instructor approval required. This course is the equivalent of MS 310. Corequisite(s): MS 440

MS 439—Lab for MS 429

Credit Hours: 0

The MS Lab focuses on the practical application of the subjects taught in the classroom during MS 429. Cadets will meet rigorous leadership challenges, reinforced by consistent instructor evaluation and mentorship. Leadership exercises will include tactical scenarios as well as the development and delivery of small group instruction for other cadets. This extensive training program also includes physical fitness, land navigation, drill and ceremonies, mission planning and written and oral communication skills. Cadets are required to participate in one field training exercise each semester, in which they will practice both leadership and teamwork and demonstrate their tactical and technical proficiency. This laboratory course companions the MS 429 class, and all contracted cadets must take the appropriate lab section simultaneously with those classes each semester. Note: Instructor approval required. This course is the equivalent of MS 409. Corequisite(s): MS 429

MS 440—Lab for MS 430

Credit Hours: 0

The MS Lab focuses on the practical application of the subjects taught in the classroom during MS 430. Cadets will meet rigorous leadership challenges, reinforced by consistent instructor evaluation and mentorship. Leadership exercises will include tactical scenarios as well as the development and delivery of small group instruction for other cadets. This extensive training program also includes physical fitness, land navigation, drill and ceremonies, mission planning and written and oral communication skills. Cadets are required to participate in one field training exercise each semester, in which they will practice both leadership and teamwork and demonstrate their tactical and technical proficiency. This laboratory course companions the MS 430 class, and all contracted cadets must take the appropriate lab section simultaneously with those classes each semester. Note: Instructor approval required. This course is the equivalent of MS 410. Corequisite(s): MS 430

Naval Science

Department of Naval Science

Department Head: Col. Streeter

Curriculum is delivered in accordance with applicable service regulation and instruction. All Navy option scholarship candidates must complete a full year of calculus, calculus-based physics, English, and American military history/national security policy courses. Additionally, all Navy option candidates are required to take a course which covers the culture of another country or group of people. All Marine option scholarship candidates must complete an American military history/national security policy course. Substitutions, exceptions, and waivers of these requirements can be authorized only by the Professor of Naval Science.

NS 101—Introduction to Naval Science

Credit Hours: 1

Navy and Marine-option. A general introduction to the Naval profession and to concepts of sea power. This course will cover the mission, organization, and warfare components of the U.S. Navy and Marine Corps. The course will also provide an overview of officer and enlisted ranks and rates, training and education, and career patterns. Additionally, Naval courtesy and customs, military justice, leadership, and nomenclature will be examined, as well as the professional competencies required to become a naval officer. No lab associated with this course.

NS 102—Sea Power and Maritime Affairs

Credit Hours: 1

Navy and Marine-option. This course is a survey of the U.S. Naval history, with emphasis on major developments. The course examines the geopolitical theory of Mahan and present day concerns in sea power and maritime affairs, including the economic and political issues of merchant marine commerce and the law of the sea. Naval aspects of U.S. conflicts from the American Revolution to Vietnam will also be examined. No lab associated with this course.

NS 111—Navy Lab for NS 101

Credit Hours: 0

Navy and USMC option. All Hands Leadership Lab and Drill Period. This practical lab is designed to reinforce what the student will learn in NS 101 to include practical communications exercises, maneuvering board problems and review plotting techniques, close order drill, manual of arms, physical fitness training ceremonial functions and required General Military Training. Corequisite(s): NS 101

NS 112—Navy Lab for NS 102

Credit Hours: 0

Navy and USMC option. All Hands Leadership Lab and Drill Period. This practical lab is designed to reinforce what the student will learn in NS 102 to include practical communications exercises, maneuvering board problems and review plotting techniques, close order drill, manual of arms, physical fitness training ceremonial functions and required General Military Training. Corequisite(s): NS 102

NS 203—Leadership and Management

Credit Hours: 1

Navy and Marine-option. This course examines the organizational behavior, management, and leadership principles in the context of naval organization. The course will also cover management functions of planning, organizing, and controlling; individual and group behavior in organizations; motivation and leadership. Experiential exercises, case studies, and laboratory discussions will be incorporated to apply the concepts, emphasizing decision making, communication, responsibility, authority, and accountability. No lab associated with this course. Note: No lab associated with this course.

NS 205—Navigation

Credit Hours: 2

Navy-option. During this course students will develop practical skills in naval piloting procedures using charts, visual and electronic aids, and theory and operation of magnetic and gyro compasses, as well as inland and international rules of the nautical road. It will provide a broad overview of the celestial coordinate system, including spherical trigonometry and how celestial information can be applied to navigation at sea as well as basic principles of environmental factors affecting naval operations. Corequisite(s): NS 211 for seeking/commissioning cadets only, no lab required if non-commissioning.

NS 206—Evolution of Warfare I

Credit Hours: 1

Marine-option. The purpose of the Evolution of Warfare course is to provide the student with a basic understanding of the concepts and themes of warfare from the beginning of recorded history to the present day. Evolution of Warfare I explores the theory and nature of war from the classical warfare practiced by the ancient Greeks and Romans through the Gunpowder and 1st and 2nd Industrial Revolutions. The student will examine the interrelations of political, strategic, operational, tactical, and technical aspects of war from the past, while bringing into focus the application of these same principles and concepts to the battlefields of today and the future. No lab associated with this course. Note: No lab associated with this course.

NS 211—Navy Lab for NS 205

Credit Hours: 0

Navy-option. Students demonstrate their ability to use skills learned in NS 205 for practical application. Corequisite(s): NS 205

NS 216—Navy Lab for NS 206

Credit Hours: 0

USMC option. All Hands Leadership Lab and Drill Period. This practical lab is designed to reinforce what the student will learn in NS 206 to include practical communications exercises, maneuvering board problems and review plotting techniques, close order drill, manual of arms, physical fitness training ceremonial functions and required General Military Training. Corequisite(s): NS 206

NS 303—Amphibious Warfare

Credit Hours: 2

Marine-option. The purpose of Amphibious Warfare is to examine the principles of warfighting from the perspective of amphibious warfare. Amphibious Warfare will cover the time period from Marathon through current amphibious operations, with special emphasis on the many amphibious operations conducted in both the European and Pacific Theaters of the WWII period. This Class looks at the evolution and development of tactics, techniques, and supporting equipment that facilitate warfighting at the Strategic, Operational, and Tactical level of warfighting. The student will use the information provided in these classes to build a foundation of knowledge for decision-making and further examination of the factors that affect amphibious warfare. Corequisite(s): NS 313 for seeking/commissioning cadets, or LS 350 for non-commissioning. Failure to take LS 350 with ROTC course will result in a grade of F in the ROTC course.

NS 304—USMC Small Unit Leadership, Weapons, and Tactics

Credit Hours: 2

Marine-option Scholarship, College Program (AS), and contracted PLC/OCC candidates. The purpose of this class is to prepare Marine Corps OCS bound cadets for the academic, moral, and physical challenges they will face during the upcoming summer. The subjects covered include operation orders, small unit tactics, leadership principles, Marine Corps history, customs and courtesies, and weapons. This class focuses on mastery of the tasks that will be required for successful completion for Marine Corps Officer Candidates School. In addition, the development of effective communication skills, command presence, peer leadership, time-compressed decision-making abilities, and general military subjects will also be evaluated. The students will apply this knowledge for successful graduation of Officer Candidates School. Corequisite(s): NS 314 for seeking/commissioning cadets, or LS 351 for non-commissioning. Failure to take LS 351 with the ROTC course will result in a grade of F in the ROTC course.

NS 308—Naval Engineering

Credit Hours: 2

Navy-option. This course provides the student with a detailed study of ship characteristics and types, including ship design and control, propulsion, hydrodynamic forces, stability, compartmentalization, and electrical and auxiliary systems. Also included are basic concepts of the theory and design of steam, gas turbine, and nuclear propulsion. Corequisite(s): NS 318 for seeking/commissioning cadets, or LS 350 for non-commissioning. **Failure to take LS 350 with ROTC course will result in a grade of F in the ROTC course.**

NS 309—Naval Weapons Systems

Credit Hours: 2

Navy-option. This course introduces the student to the theory and employment of weapons systems, including the processes of detection, evaluation, threat analysis, weapon selection, delivery, guidance, and explosives. The student will also become familiar with fire control systems and major weapons types, including capabilities and limitations, physical aspects of radar and underwater sound, and facets of command, control, and communications as means of weapons system integration. No lab associated with this course. Note: No lab associated with this course.

NS 313—Marine Lab for NS 303

Credit Hours: 0

Marine-option. The purpose of the lab is to provide the student further understanding of the fundamentals of Amphibious Warfare through the review of case studies and practical application of the USMC war fighting principles. In addition, subject such as introductory Marine Corps customs and courtesies, leadership, traditions, and tactical decision games will supplement the learning environment. Corequisite(s): NS 303 for commissioning cadets, or LS 350 for non-commissioning.

NS 314—Marine Lab for NS 304

Credit Hours: 0

Marine-option Scholarship, College Program (AS), and contracted PLC/OCC candidates. The purpose of the lab is to provide further mastery through practical application of the subjects presented in the core curriculum. This included communication and decision-making evaluations, assessment of peer leadership skills, land navigation, military drill, and scenario-based leadership reaction exercises. Corequisite(s): NS 304 for commissioning cadets, or LS 351 for non-commissioning.

NS 318—Naval Lab for NS 308

Credit Hours: 0

Navy-option. The purpose of this lab is to reinforce topics covered in Naval Engineering as well as providing instruction that will prepare midshipmen for their first class summer cruise. The course will also address the surface, submarine, aviation, and special warfare communities to help prepare midshipmen for service assignment. Corequisite(s): NS 308 for commissioning cadets, or LS 350 for non-commissioning.

NS 319—Navy Lab for NS 309

Credit Hours: 0

Navy option. All Hands Leadership Lab and Drill Period. This practical lab is designed to reinforce what the student will learn in NS 309 to include practical communications exercises, maneuvering board problems and review plotting techniques, close order drill, manual of arms, physical fitness training ceremonial functions and required General Military Training.

NS 402—Leadership and Ethics

Credit Hours: 2

Navy and Marine-option (Seniors). A seminar that prepares future leaders by exploring *and applying* a diverse range of leadership and ethical tools to enhance objective, sound, and timely decision-making in the most challenging environments. This course emphasizes the importance of leadership that adheres to the highest standards of character and integrity. It is a "Leadership Seminar" where fundamentals and applications of leadership and ethics will be discussed. Note: This is the capstone course within the NROTC academic curriculum. Corequisite(s): NS 412 for Navy seeking/commissioning cadets, NS 414 for Marine commissioning cadets, or LS 451 for non-commissioning cadets. Failure to take LS 451 with ROTC course will result in a grade of F in the course.

NS 403—Evolution of Warfare II

Credit Hours: 2

Marine-option. This is a continuation of the study of the art and concepts of warfare examined in Evolution of Warfare I. Evolution of Warfare II explores the changes in the theory and nature of war from the 2nd Industrial Revolution through contemporary warfare, as well as the potential future of warfare. Future Marine officers will examine the interrelations of political, strategic, operational, tactical, and technical aspects of war from the past, while bringing into focus the application of these same principles and concepts to the battlefields of today and the future. Corequisite(s): NS 413 for seeking/commissioning cadets, or LS 450 for non-commissioning. Failure to take LS 450 with ROTC course will result in a grade of F in the course.

NS 408—Naval Operations and Seamanship

Credit Hours: 2

Navy-option. Relative motion vector analysis theory, formation tactics, and ship employment; practical skills in relative motion problems. Controllable and non-controllable forces in ship handling, ship behavior, and maneuvering characteristics; various methods of visual communication, including flag hoist, flashing light, and semaphore. Corequisite(s): NS 411 for seeking/commissioning cadets, or LS 450 for non-commissioning. Failure to take LS 450 with ROTC course will result in a grade of F in the course.

NS 411—Navy Lab for NS 408

Credit Hours: 0

Navy-option. This lab is designed to reinforce what the student will learn in NS 408 to include practical communications exercises, maneuvering board problems and review plotting techniques learned in NS 205. Corequisite(s): NS 408.

NS 412—Navy Lab for NS 402

Credit Hours: 0

Navy-option. A continuation of NS 411, this lab is designed to reinforce the basic skills, organizational knowledge and command techniques that prospective ensigns will employ in the Naval Operating Forces. The class ties together the leadership application for Naval officers with regard to counseling, financial planning, deployments and career management for surface, sub-surface, aviation and special warfare officers. Corequisite(s): NS 402.

NS 413—Marine Lab for NS 403

Credit Hours: 0

Marine-option. This lab is designed to reinforce the basic skills, organizational knowledge and command techniques that prospective second lieutenants will employ in the Fleet Marine Force (FMF). The course will address such basic skills as leading Marines, professional development, counseling and performance evaluation, training, operational risk management and basic officer administration. Corequisite(s): NS 403.

NS 414—Marine Lab for NS 402

Credit Hours: 0

Marine-option. This lab is designed to reinforce the basic skills, organizational knowledge and command techniques that prospective second lieutenants will employ in the Fleet Marine Force (FMF). The course will address such topics as USMC and sister service mission and capabilities, operations and tactics, tactical decision making, and commissioning preparation. Corequisite(s): NS 402.

Physical Education

Department of Physical Education

Department Head: Col. Coale

Classes prior to 2016:

All cadets are required to take seven consecutive semesters of physical education classes and earn four semester credit hours (exclusive of any 3 credit hour course), to meet graduation requirements. New cadets do not take a physical education class first semester of their rat year. Second semester of their rat year, and first semester of the third class year, cadets will take either Swimming (PE 100 or 101), or Boxing (PE 102). Second semester of the third class year, and first semester of the second class year, cadets will take either Drug and Alcohol (PE 200), or Wrestling (PE 211). Second semester of the second class year, and first semester of the first class year, cadets will take either Principles of Physical Conditioning (PE 300), or a PE elective course. Second semester of the first class year cadets will take a PE elective course.

Class of 2016 and beyond:

All cadets are required to take seven semesters of physical education classes, and earn four semester credit hours (exclusive of any 3 credit hour course) to meet graduation requirements. New cadets are required to take Wellness Concepts (PE 105), and Boxing PE 102 during their fourth-class year. Third-class year cadets are required to take Swimming (PE 100 or 101), and Principles of Physical Education (PE 300). Cadets will take two PE Elective courses during their second-class year. Cadets will also take a PE elective during the first semester of their first-class year to complete their Physical Education requirements. There is no PE requirement (OPEN semester), for the second semester of the first-class year. To accommodate special circumstances that may arise, such as study abroad and medical/health issues, the OPEN semester may occur during the fall/spring of the second-class year, or the fall of the first class year.

NS 213—Navy Lab for NS 203

Credit Hours: 0

Navy and USMC option. All Hands Leadership Lab and Drill Period. This practical lab is designed to reinforce what the student will learn in NS 203 to include practical communications exercises, maneuvering board problems and review plotting techniques, close order drill, manual of arms, physical fitness training ceremonial functions and required General Military Training. Corequisite(s): NS 206

PE 100—Beginning Swimming

Lecture Hours: 0 **Lab Hours:** 2 **Credit Hours:** 0.5

This course is for non-swimmers only. Note: Instructor approval required.

PE 101—Basic Swimming and Survival

Lecture Hours: 0 **Lab Hours:** 1 **Credit Hours:** 0.5

Stressed are the basic strokes, survival support, breath control skills, and pre-lifesaving skills. Note: This is required PE course and should be taken during the cadet's 3rd class year.

PE 102—Boxing

Lecture Hours: 0 **Lab Hours:** 1 **Credit Hours:** 0.5

Instruction in the fundamentals of boxing. Note: This is a required PE course and should be taken during the cadet's 4th class year.

PE 105—Wellness Concepts

Lecture Hours: 1 **Lab Hours:** 0 **Credit Hours:** 0.5

This course will provide an introduction to basic nutrition and dimensions of wellness. Major topics will include, choosing a nutritious diet, maintaining healthy body composition and body weight, managing stress, avoiding risks from harmful habits, and sexual health. Note: This is a required PE course and should be taken during the cadet's 4th class year.

PE 190—Independent Research

Lecture Hours: 0 **Lab Hours:** 2-6 **Credit Hours:** 1-3

This course is for rising third classmen pursuing research during the summer. Permission of instructor and department head required.

PE 200—Drug and Alcohol Abuse Awareness

Lecture Hours: 1 **Lab Hours:** 0 **Credit Hours:** 0.5

A review of the current understanding of the short-term and long-term effects of the chronic use of drugs and alcohol. Confrontation and intervention techniques will be taught. Current laws will be reviewed. Note: All required P.E. courses must be completed prior to taking electives. Prerequisite(s): PE 100/PE 101, PE 102, PE 105, & PE 300

PE 211—Wrestling

Lecture Hours: 0 **Lab Hours:** 1 **Credit Hours:** 0.5

Fundamentals of wrestling. Note: All required P.E. courses must be completed prior to taking electives. Prerequisite(s): PE 100/PE 101, PE 102, PE 105, & PE 300

PE 212—Advanced Boxing

Lecture Hours: 0 **Lab Hours:** 1 **Credit Hours:** 0.5

This course will review the skills and techniques covered in the required boxing course (PE 102), and introduce more advanced level work from both the offensive and defensive perspective. Emphasis will also be placed on ring strategy and scoring. Prerequisite(s): PE 100 or PE 101, PE 102, PE 105, & PE 300

PE 213—Global Food and Nutrition

Lecture Hours: 0 **Lab Hours:** 1 **Credit Hours:** 0.5

This course, PE 213, examines food culture, health, and nutrition of various populations around the world—and explore factors that influence food availability and health. Lifestyle

choices that appear to lead to optimal long-term health will be identified and discussed. Prerequisite(s): PE 100 or PE 101, PE 102, PE 105, & PE 300

PE 290—Independent Research

Lecture Hours: 0 **Lab Hours:** 2-6 **Credit Hours:** 1-3

This course is for rising second classmen pursuing research during the summer. Permission of instructor and department head required.

PE 300—Principles of Physical Conditioning

Lecture Hours: 0 **Lab Hours:** 1 **Credit Hours:** 1

An elementary course in exercise physiology. Note: This is a required PE course and should be taken during the cadet's 3rd class year.

PE 303—Karate

Lecture Hours: 1 **Lab Hours:** 0 **Credit Hours:** 0.5

This course is designed to be a basic karate course. Cadets will be taught defense against either violent or minor attacks from various situations. The cadets will learn a range of self-defense techniques involving: holds, escapes, and locks. Observation and awareness skills of one's surrounding will also be taught to avoid and prevent trouble or problems before they develop. Safety in training will be strictly emphasized during class. Note: All required P.E. courses must be completed prior to taking electives. Prerequisite(s): PE 100/PE 101, PE 102, PE 105, & PE 300

PE 306—Nutrition and Cardiovascular Health

Lecture Hours: 1 **Lab Hours:** 0 **Credit Hours:** 0.5

This course will examine the anatomy and function of the cardiovascular system as well as the influence of diet and exercise on the body. Emphasis will be on long-term healthy lifestyle management for prevention of cardiovascular disease. Students will also learn to development nutrition and exercise plans for various cardiovascular health conditions. Note: All required P.E. courses must be completed prior to taking electives. Prerequisite(s): PE 100/PE 101, PE 102, PE 105, & PE 300

PE 315—Combatives

Lecture Hours: 0 **Lab Hours:** 1 **Credit Hours:** 0.5

The purpose of this course is to teach cadets basic grappling techniques in accordance with the United States Army's Level One combative program. Note: All required P.E. courses must be completed prior to taking electives. Prerequisite(s): PE 100/PE 101, PE 102, PE 105, & PE 300

PE 321—Leadership Exercise and Sport

Lecture Hours: 0 **Lab Hours:** 1 **Credit Hours:** 0.5

This course will provide the student with an introduction to leadership theories and practices, exercise physology and physical training. Basic concepts and components of leadership within the exercise and sporting environment will be introduced so that the student may use this knowledge for the promotion of his/her personal fitness benefits. Note: All required P.E. courses must be completed prior to taking electives. Prerequisite(s): PE 100/PE 101, PE 102, PE 105, & PE 300

PE 322—Leadership in Adventue Programming

Lecture Hours: 0 **Lab Hours:** 1 **Credit Hours:** 0.5

Leadership in Adventure Programming is designed to develop cadets' leadership skills in the outdoor adventure setting. Cadets will be exposed to outdoor leadership theories, and learn how to apply them in a practical setting. An examination of basic learning styles, with an emphasis on how to adapt leadership styles in order to facilitate group success will be covered. Topics include: Functions of Outdoor Leadership, Conditional Outdoor Leadership Theory (COLT), Kolb's Experiential Learning Cycle, Program Planning, Sequencing, Facilitation and Debriefing Skills, Group Formation Theory and Risk Management. Note: All required P.E. courses must be completed prior to taking electives. Prerequisite(s): PE 100/PE 101, PE 102, PE 105, & PE 300

PE 323—Cadet Peer Health/Wellness Education

Lecture Hours: 1 **Lab Hours:** 0 **Credit Hours:** 0.5

An examination of the theory and practice of peer health/wellness education and peer support and approaches to each in higher education. Course will equip cadets to deliver peer health/wellness education and peer support to the Corps of Cadets. Course will serve as a prerequisite for Cadet Peer Educator (CPE) membership which is a service group supervised by the VMI Center for Cadet Counseling. Note: All required P.E. courses must be completed prior to taking electives. Prerequisite(s): PE 100/PE 101, PE 102, PE 105, & PE 300

PE 324—Exercise Physiology

Lecture Hours: 3 **Lab Hours:** 3 **Credit Hours:** 4

This course will examine how the body responds and adapts to exercise. It will focus on a study of the metabolic, muscular, cardiovascular, and respiratory changes associated with both aerobic and anaerobic exercise. Emphasis will be placed on the application of our physiologic understanding of exercise to developing training programs and improving performance. The laboratory component will introduce students to state of art equipment used to assess different components of fitness. Data collection and analysis will be emphasized. Note: This course does not count as a PE elective. Prerequisite(s): BI 101 & BI 102 or permission of instructor.

PE 325—Understanding Sports Injuries

Lecture Hours: 0 **Lab Hours:** 1 **Credit Hours:** 0.5

The purpose of this course is to provide an overview in the preventing, recognition, and treatment common sports injuries that occur within the active population. Course content will include anatomical terminology, and mechanisms of injuries. Note: All required P.E. courses must be completed prior to taking electives. Prerequisite(s): PE 100/PE 101, PE 102, PE 105, & PE 300

PE 326—Dynamic Stretching & Speedwork for Running

Lecture Hours: 1 **Lab Hours:** 0 **Credit Hours:** 0.5

This course is designed to assist cadets in improving running form and speed, specifically for a 1.5 mile run. This is a skills based class where cadets will learn how to use dynamic stretching for running, complete high intensity track workouts, and develop training plans to achieve specific training goals. Note: All required P.E. courses must be completed prior to taking electives. Prerequisite(s): PE 100/PE 101, PE 102, PE 105, & PE 300

PE 327—Passive Stretching and Yoga Exercise

Lecture Hours: 1 **Lab Hours:** 0 **Credit Hours:** 0.5

This course is an introduction to passive stretching techniques. Concepts taught in PE 300 Principles of Conditioning will be reviewed and implemented throughout the semester. Content will combine theory and movement. Class periods will be broken up into mini lectures followed by activity. Both western and eastern approaches will be covered. Note: All required P.E. courses must be completed prior to taking electives. Prerequisite(s): PE 100/PE 101, PE 102, PE 105, & PE 300

PE 328—Stress Reduction and Mindfulness

Lecture Hours: 1 **Lab Hours:** 0 **Credit Hours:** 0.5

This course is introductory and provides students with both theoretical material and experiential practice in the area of stress reduction and mindfulness. History, efficacy and the application of stress reduction/mindfulness practice serve as foundation to specific exercises/techniques (e.g., breathing, yoga, and imagery) taught. Students are given tools to practice and thereby implement a stress reduction/mindfulness practice for the semester. These techniques can be utilized throughout the students' life. Note: All required P.E. courses must be completed prior to taking electives. Prerequisite(s): PE 100/PE 101, PE 102, PE 105, & PE 300

PE 340—Teaching Mentorship in Physical Education

Lecture Hours: 1 **Lab Hours:** 3 **Credit Hours:** 1-3

Students with at least a 3.0 GPA in their major and who earn an A or a B in a Physical Education course, or by approval of the Department Head, may serve as a teaching assistant for a portion of a Physical Education course in a subsequent semester. The teaching mentee's duties may vary, but a mentee must meet with his/her mentoring professor weekly and attend all class meetings of the course. Student duties will be determined by the course professor and approved by the Department Head. Duties will include: meeting with the professor each week to discuss teaching strategies and assisting the professor by helping prepare classrooms, equipment, quizzes and/or practicals, and assisting with teaching in the course. This is a pass/fail course. It may only be taken once and it can count as an exercise science elective. Registration for this course requires Department Head approval.

PE 380—Kinesiology and Functional Anatomy

Lecture Hours: 3 **Lab Hours:** 1 **Credit Hours:** 3

This course is designed to provide the cadet with a comprehension of human movement. Subject matter includes musculoskeletal anatomy, joint structure and function, and biomechanics. The cadet is prepared to identify the various phases of motion and explain the mechanical significance of each in producing the desired outcome. Note: This course does not count as a PE elective.

PE 390—Independent Research

Lecture Hours: 0 **Lab Hours:** 2-6 **Credit Hours:** 1-3

This course is for rising first classmen pursuing research during the summer. Permission of instructor and department head required.

PE 401—Golf

Lecture Hours: 0 **Lab Hours:** 1 **Credit Hours:** 0.5

A beginning course. Note: All required P.E. courses must be completed prior to taking electives. Prerequisite(s): PE 100/PE 101, PE 102, PE 105, & PE 300

PE 402—Lifeguarding

Lecture Hours: 0 **Lab Hours:** 1 **Credit Hours:** 0.5

Successful completion leads to certification as a lifeguard. Note: All required P.E. courses must be completed prior to taking electives. Prerequisite(s): PE 100/PE 101, PE 102, PE 105, PE 300, & PE 404

PE 403—Advanced Swimming and Survival

Lecture Hours: 0 **Lab Hours:** 1 **Credit Hours:** 0.5

The course is designed for advance swimming and survival techniques. The course will cover strokes, conditioning, surface diving, snorkel introduction, underwater retrieval of gear, and advance survival techniques. Note: All required P.E. courses must be completed prior to taking electives. Prerequisite(s): PE 100/PE 101, PE 102, PE 105, & PE 300

PE 404—C.P.R.

Lecture Hours: 1 **Lab Hours:** 0 **Credit Hours:** 0.5

Successful completion confers American Red Cross certification. This course is a prerequisite for PE 402, Lifeguarding. Note: All required P.E. courses must be completed prior to taking electives. Prerequisite(s): PE 100/PE 101, PE 102, PE 105, & PE 300

PE 405—Dietary Supplements

Lecture Hours: 1 **Lab Hours:** 0 **Credit Hours:** 0.5

Provides information on the benefits and detriments of common physical performance stimulants. Note: All required P.E. courses must be completed prior to taking electives. Prerequisite(s): PE 100/PE 101, PE 102, PE 105, & PE 300

PE 406—Handball/Racquetball

Lecture Hours: 0 **Lab Hours:** 1 **Credit Hours:** 0.5

A beginning course. Note: All required P.E. courses must be completed prior to taking electives. Prerequisite(s): PE 100/PE 101, PE 102, PE 105, & PE 300

PE 407—Volleyball

Lecture Hours: 0 **Lab Hours:** 1 **Credit Hours:** 0.5

A beginning course. Note: All required P.E. courses must be completed prior to taking electives. Prerequisite(s): PE 100/PE 101, PE 102, PE 105, & PE 300

PE 409—Tennis

Lecture Hours: 0 **Lab Hours:** 1 **Credit Hours:** 0.5

A beginning course. Note: All required P.E. courses must be completed prior to taking electives. Prerequisite(s): PE 100/PE 101, PE 102, PE 105, & PE 300

PE 411—Fundamentals of Resistance Training

Lecture Hours: 1 **Lab Hours:** 0 **Credit Hours:** 0.5

Fundamentals of weightlifting. Note: All required P.E. courses must be completed prior to taking electives. Prerequisite(s): PE 100/PE 101, PE 102, PE 105, & PE 300

PE 412—Weight Training

Lecture Hours: 0 **Lab Hours:** 1 **Credit Hours:** 0.5

This will be an activity course designed to give cadets "hands-on" exposure to various types of resistive training programs. Cadets will actively participate in a variety of predetermined functional lifting programs relative to all of the components (strength, power, endurance) of muscular development. Note: All required P.E. courses must be completed prior to taking electives. Prerequisite(s): PE 100/PE 101, PE 102, PE 105, & PE 300

PE 413—Cardiovascular Training Application

Lecture Hours: 0 **Lab Hours:** 1 **Credit Hours:** 0.5

This is an activity course designed to expose cadets to various types of training programs. A cross-training approach will be utilized requiring cadet participation on a weekly basis with regard to a variety of aerobic and anaerobic training adaptations. This course is designed to be physically demanding. It will not only help cadets attain a higher level of fitness, it will also give them an opportunity to learn different training adaptations which they can utilize beyond their VMI experience. Note: All required P.E. courses must be completed prior to taking electives. Prerequisite(s): PE 100/PE 101, PE 102, PE 105, & PE 300

PE 414—Basketball

Lecture Hours: 0 **Lab Hours:** 1 **Credit Hours:** 0.5

This course will introduce cadets to the basic rules and skills of basketball as well as teach offensive and defensive principles. Individual skills and team concepts will be covered. This course will have a high activity/fitness component. Note: All required P.E. courses must be completed prior to taking electives. Prerequisite(s): PE 100/PE 101, PE 102, PE 105, & PE 300

PE 430—Health Education

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Topics to be studied include: recognition and management of stress, intervention and confrontation in drug/alcohol abuse, sexuality, AIDS, and other sexually-transmitted diseases, and other subjects such as nutrition, genetic counseling, cardiovascular health, and cancer. Note: This course does not count as a PE elective.

PE 431—Physical Activity and Wellness Through the Lifespan

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course presents an overview of the benefits of lifespan physical activity and structured exercise programs for adults. Students will examine the changes that occur during exercise as it influences persons of all ages, including individuals with special medical considerations. The cadets will learn to develop exercise and fitness programs specifically for adults based upon age, medical conditions, and special needs. Cadets focus on the psychosocial factors related to participants and their motivated behaviors, including adoption, adherence, and compliance, in physical activity and exercise. Note: This course does not count as a PE elective.

PE 432—Concepts of Strength Training and Conditioning

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course provides principles and theories related to strength training and conditioning. Concepts and applications in exercise testing and evaluation; program design, implementation, and evaluation; facility planning and administration, as well as safety procedures are discussed. Note: This course does not count as a PE elective.

PE 433—Nutrition

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Designed to make students think about their food choices and the impact of those choices on their health. Basic concepts of nutrition including, nutrient digestion, absorption, and transport, energy balance, diet planning, and vitamin and mineral requirements will be discussed. Particular attention will be focused on the role of nutrition in the development of chronic diseases. Students will use computer software to analyze their diets and to develop balanced meal plans for themselves and others. Note: This course does not count as a PE elective.

PE 434—Integrative Medicine and Exercise

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course will examine approaches that were once considered alternative and complementary but are now being used within traditional western medicine—relative to the field of medicine and the wellness component of fitness. These approaches include exercise, mindfulness, meditation, tai chi, yoga, Qi Gong, traditional Chinese medicine, music therapy and acupuncture.

PE 490—Exercise Science Internship

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Under the supervision of a department faculty adviser, cadets may earn up to three hours of academic credit as a business elective in a summer internship of at least 8 weeks duration in a full-time position. Internships will normally be conducted with a private firm, a governmental agency, or a non-profit organization. Department Head approval required.

Psychology

Department of Psychology

Department Head: Col. Gire

Requirements for a major in psychology are specified in Psychology.

Note: A grade of C or higher is required in PS 201 for all upper level PS courses starting with the Class of 2014.

PS 201—Introduction to Psychology

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Principles of human and animal behavior including brain function, motivation, learning, thinking, perception, emotions, personality, attitudes, and aptitudes. This course is a prerequisite for all other courses in psychology.

PS 202—Introduction to Research Methods

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Provides the foundation for understanding, interpreting, and designing psychological research. Topics include developing a research question, types of variables and how they are measured, participant selection techniques, nonexperimental and experimental research methods, ethics in psychology, and the communication of scientific research in a standard format. Prerequisite(s): PS 201 with a minimum grade of C.

PS 205—Statistics for the Behavioral Sciences

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course builds upon research methodology developed in PS202 and briefly reviews critical concepts from MA106. Additionally, students will learn statistical techniques for analyzing both categorical and continuous data. Topics include analysis of variance, covariate analyses, chi-square tests, nonparametric tests, and reliability analyses. Students will be immersed in hands-on SPSS lab work throughout. Coursework culminates with a final project that is based on a publicly sourced dataset provided by the instructor. Students will design their own research question, create hypotheses, and test those hypotheses using analytical techniques learned in the course Prerequisite(s): PS 201 with a minimum grade of C & PS 202.

PS 290—Independent Research

Lecture Hours: 0 **Lab Hours:** 4 **Credit Hours:** 2

These courses are for third classmen pursuing research during the fall and/or spring semesters. Permission of instructor and department head required. Prerequisite(s): PS 201 with a minimum grade of C.

PS 291—Independent Research

Lecture Hours: 0 **Lab Hours:** 6 **Credit Hours:** 3

These courses are for third classmen pursuing research during the fall and/or spring semesters. Permission of instructor and department head required. Prerequisite(s): PS 201 with a minimum grade of C.

PS 292—Independent Research

Lecture Hours: 0 **Lab Hours:** 4 **Credit Hours:** 2

These courses are for rising second classmen pursuing research during the summer. Permission of instructor and department head required. Prerequisite(s): PS 201 with a minimum grade of C.

PS 293—Independent Research

Lecture Hours: 0 **Lab Hours:** 8 **Credit Hours:** 4

These courses are for rising second classmen pursuing research during the summer. Permission of instructor and department head required. Prerequisite(s): PS 201 with a minimum grade of C.

PS 301—Psychology of Learning

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

The empirical and theoretical examination of learning and memory. Topics covered include conditioning, discrimination, short-term and long-term retention. Prerequisite(s): PS 201 with a minimum grade of C.

PS 302—Social Psychology

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Behavior and experiences of the individual in society, group dynamics and social institutions, human relations, morale and leadership. Prerequisite(s): PS 201 with a minimum grade of C.

PS 304—Educational Psychology

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Emphasis is upon learning and instruction by cadets and teacher. Educational theories and their practice are explored through tutoring in the local schools and colleges. Useful whether or not the cadet plans a teaching career. Prerequisite(s): PS 201 with a minimum grade of C.

PS 305—Abnormal Psychology

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An introductory course on the scientific study and treatment of deviant human behavior. This course will briefly trace the history of treatment of psychological disorder from the middle ages to the present, extensively describe important determinants of personality, causes of abnormal behavior (psychogenic and organic), describe major personality theories and methods of therapy. Prerequisite(s): PS 201 with a minimum grade of C.

PS 307—Developmental Psychology

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A survey of human growth and development, this course presents a life-span approach to the important, modern forces which have the greatest impact on the life changes of the individual. Opportunities to apply textbook theories and principles will be provided throughout the semester. Prerequisite(s): PS 201 with a minimum grade of C or permission of instructor.

PS 308—Motivation

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Motivation is a theoretical concept that accounts for those factors that influence the arousal of behavior, the direction of behavior, and the persistence of behavior. PS 308 is about the motivational determinants of behavior in organizations. It deals extensively with motivation theory, research, and practice, including such topics as how job design, leadership style, and pay systems affect work motivation and job satisfaction. Prerequisite(s): PS 201 with a minimum grade of C.

PS 309—Fundamentals of Biopsychology (formerly PS 203—Biopsychology I)

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An introduction to the study of the biological bases of behavior, with emphases on neuroanatomy and neurophysiology, biopsychological research methods, and sensory and motor systems. Prerequisite(s): PS 201 with a minimum grade of C.

PS 313—Forensic Psychology

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Criminal behavior is studied from the psychological perspective. The criminal offender is portrayed as being embedded in and continually influenced by multiple systems within the psychosocial environment. Topics include: biological and learning factors of criminal behavior, juvenile delinquency, the psychopath, the mentally disordered offender, aggression and violence, homicide, sexual offenses, economic crime, drugs, and more. Prerequisite(s): PS 201 with a minimum grade of C, and PS 305.

PS 314—Physiology and Behavior (formerly PS 204—Biopsychology II)

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An in-depth discussion of the physiological mechanisms underlying behavior. Topics include brain damage and neuroplasticity, learning and memory, and motivation and emotion. Prerequisite(s): PS 201 with a minimum grade of C.

PS 315—Theories of Personality

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A study of the structure of personality and the dimensions along which individuals differ. The contributions of major personality theorists and the implications of current research are considered for trait, biological, psychoanalytical, behavioristic, cognitive, humanistic, and cross-cultural approaches. Prerequisite(s): PS 201 with a minimum grade of C.

PS 316—Psychology Internship

Lecture Hours: 1 **Lab Hours:** 4 **Credit Hours:** 3

Cadets serve as interns in various psychology-related external agencies under the supervision of a member of the PS faculty in cooperation with officials of the external agency. Coursework will involve selected readings, completion of an appropriate project designed in conjunction with agency staff, and a final report presented orally and in writing to supervising faculty. The report will follow American Psychological Association format. This course may be repeated once for a total of 6 semester credits. Cadets must enroll in this course at VMI before they can be allowed to proceed with the internship. Open to rising first classmen and second-class PS majors. A cumulative GPA of 2.5 or higher is required.

PS 317—Sports Psychology

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course examines the way people think, feel, and behave during sport and exercise activities and the practical application of that knowledge. The specific course objectives are to: a) increase understanding of how psychological factors influence performance in sports, b) help acquire skills and knowledge about sport psychology that one can apply as an athlete, a sports team leader, or a coach, and c) provide keys to optimal experiences and performances in sport, and gain skills that help more consistently experience "flow," being in the zone," or "feeling on a high" in sports. Prerequisite(s): PS 201 with a minimum grade of C.

PS 318—Introduction to Counseling and Psychotherapy

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An overview of the major concepts of contemporary therapeutic systems and an introduction to the elements of effective counseling and psychotherapy. Empirical evaluation of treatment outcomes is emphasized. Research, legal, and ethical issues are examined. Students will learn basic counseling and communication skills through lecture, demonstration, and experiential exercises. Prerequisite(s): PS 201 with a minimum grade of C.

PS 319—Creative and Critical Thinking

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This elective is designed to (1) examine the theories, research, competencies, and processes associated with creative and critical thinking and (2) enhance the student's proficiency in innovative, disciplined and discerning thinking. The course will explore the cognitive skills that allow one to deal with issues, problems, and challenging situations requiring creative solutions and/or critical analysis. Course topics include metacognition, cognitive style, the creative problem-solving process, creative climate, being a fair-minded thinker, the elements of critical thinking, irrational thinking, and recognizing propaganda and fallacies. Prerequisite(s): PS 201 with a minimum grade of C.

PS 320—Positive Psychology

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course will provide an introduction to key concepts in the area of Positive Psychology. Major topics will include happiness, flow, optimism, forgiveness, goal setting and mindfulness. Class discussions will include a mix of theoretical perspectives, examinations of empirical studies and methods for applying key findings to one's own life. Prerequisite(s): PS 201 with a minimum grade of C.

PS 321—Stress and Health

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This seminar-style course provides an overview of physiological stress-response systems and an in-depth analysis of topics pertaining to the relationship between stress and health/illness. Major topics include: theories of stress, physiological response patterning in stress and emotion, psychological states and traits moderating the stress-illness relationship, cardiovascular stress-reactivity, social psychophysiology, coronary-prone behavior, and psychoneuroimmunology. Theoretical perspectives and empirical studies are examined and course content is organized around a reading list. Prerequisite(s): PS 201 with a minimum grade of C.

PS 322—Psychological Assessment

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Students will learn to administer, score, and interpret a standard psychological test battery. Tests include structured clinical interviews, self-report questionnaires, and performance-based tests. Each student will present life history and testing data obtained from a volunteer subject, and offer empirical and theory-based interpretations of test findings. Each psychological assessment constitutes a comprehensive, in-depth case study of a single subject that will illustrate critical concepts in personality science, psychometrics, and psychopathology. Test construction, test theory, ethics, critical thinking, and therapeutic assessment practices will be explored. Prerequisite(s): PS 201 with a minimum grade of C.

PS 344—Leadership in Organizations

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

The focus is on the interaction between leaders, followers, and the situational context of the leadership process. Students study the leader's direct influence on individual motivation and group processes through the application of leadership theories, skills, and attributes. They also learn how to influence subordinates indirectly through organizational systems, procedures, culture, and ethical climate. The design of the course includes self-assessment, self-disclosure, small group exercises in contrived situations, and analysis of case studies.

PS 351—Biological Psychology Laboratory

Lecture Hours: 0 **Lab Hours:** 3 **Credit Hours:** 1

A laboratory course for students participating in scientific research related to biological psychology. The lab emphasizes scientific observation, analytical techniques, and communication

of results. Prerequisite(s): PS 201 with a minimum grade of C & PS 202 and PS 205. Corequisite(s): PS 309 or PS 314.

PS 352—Health Psychology Laboratory

Lecture Hours: 0 **Lab Hours:** 3 **Credit Hours:** 1

A laboratory course for students participating in scientific research related to health psychology. The lab emphasizes scientific observation, analytical techniques, and communication of results. Prerequisite(s): PS 201 with a minimum grade of C & PS 202 and PS 205.

PS 353—Psychology of Learning Laboratory

Lecture Hours: 0 **Lab Hours:** 3 **Credit Hours:** 1

A laboratory course for students participating in scientific research related to the psychology of learning. The lab emphasizes scientific observation, analytical techniques, and communication of results. Prerequisite(s): PS 201 with a minimum grade of C & PS 202 and PS 205. Corequisite(s): PS 301

PS 354—Social Psychology Laboratory

Lecture Hours: 0 **Lab Hours:** 3 **Credit Hours:** 1

A laboratory course for students participating in scientific research related to social psychology. The lab emphasizes scientific observation, analytical techniques, and communication of results. Prerequisite(s): PS 201 with a minimum grade of C & PS 202 and PS 205. Corequisite(s): PS 302

PS 355—Abnormal Psychology Laboratory

Lecture Hours: 0 **Lab Hours:** 3 **Credit Hours:** 1

A laboratory course for students participating in scientific research related to abnormal psychology. The lab emphasizes scientific observation, analytical techniques, and communication of results. Prerequisite(s): PS 201 with a minimum grade of C & PS 202 and PS 205. Corequisite(s): PS 305

PS 356—Developmental Psychology Laboratory

Lecture Hours: 0 **Lab Hours:** 3 **Credit Hours:** 1

A laboratory course for students participating in scientific research related to developmental psychology. The lab emphasizes scientific observation, analytical techniques, and communication of results. Prerequisite(s): PS 201 minimum grade of C & PS 202 and PS 205. Corequisite(s): PS 307

PS 357—Personality Psychology Laboratory

Lecture Hours: 0 **Lab Hours:** 3 **Credit Hours:** 1

A laboratory course for students participating in scientific research related to personality psychology. The lab emphasizes scientific observation, analytical techniques, and communication of results. Prerequisite(s): PS 201 with a minimum grade of C & PS 202 and PS 205.

PS 358—Positive Psychology Laboratory

Lecture Hours: 0 **Lab Hours:** 3 **Credit Hours:** 1

A laboratory course for students participating in scientific research related to positive psychology. The lab emphasizes scientific observation, analytical techniques, and communication of results. Note: Cadets are strongly encouraged to take PS 320 as a prereq/coreq for this lab. Prerequisite(s): PS 201 with a minimum grade of C & PS 202 and PS 205.

PS 390—Independent Research

Lecture Hours: 0 **Lab Hours:** 4-8 **Credit Hours:** 2-4

These courses are for second classmen pursuing research during the fall and/or spring semesters. Permission of instructor and department head required. Prerequisite(s): PS 201 with a minimum grade of C.

PS 391—Independent Research

Lecture Hours: 0 **Lab Hours:** 4-8 **Credit Hours:** 2-4

These courses are for second classmen pursuing research during the fall and/or spring semesters. Permission of instructor and department head required. Prerequisite(s): PS 201 with a minimum grade of C.

PS 392—Independent Research

Lecture Hours: 0 **Lab Hours:** 4-8 **Credit Hours:** 2-4

These courses are for rising first classmen pursuing research during the summer. Permission of instructor and department head required. Prerequisite(s): PS 201 with a minimum grade of C.

PS 393—Independent Research

Lecture Hours: 0 **Lab Hours:** 4-8 **Credit Hours:** 2-4

These courses are for rising first classmen pursuing research during the summer. Permission of instructor and department head required. Prerequisite(s): PS 201 with a minimum grade of C.

PS 401—Psychology of Cognition

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An introductory course on human cognition. Topics include perception, attention, memory, visual knowledge, decision-making, problem solving, language, and consciousness. Emphasis will be placed on examining different approaches for studying and defining cognition, as well as the contributions that neuroscientific research has made to the field. Prerequisite(s): PS 201 with a minimum grade of C.

PS 402W—Advanced Research Methods (formerly Research Methods in Psychology)

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A course covering the principal areas of general and experimental psychology. Note: Writing Intensive Course (W). Prerequisite(s): PS 201 with a minimum grade of C, PS 202, & PS 205.

PS 403W—Independent Project

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A continuation of PS 402W. Note: Writing Intensive Course (W). Prerequisite(s): PS 402W

PS 404—History and Systems in Psychology

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course is designed for psychology majors and is a requirement for graduation. It provides an in depth review of historical events and figures leading to the emergence of the science of psychology and the development of major psychological theories. The philosophical and scientific origins of psychology as a science are analyzed as well as the impact of emerging movements on important psychologists. The focus of much of the reading is the history of psychology as reflected by the individuals, theories, and experimental investigations of this discipline. Rather than focus on broad philosophical and historical issues, the course is aimed at specific emerging philosophical trends that lead to the development of the discipline. Prerequisite(s): PS 201 with a minimum grade of C.

PS 451—Cognitive Psychology Laboratory

Lecture Hours: 0 **Lab Hours:** 3 **Credit Hours:** 1

A laboratory course for students participating in scientific research related to cognitive psychology. The lab emphasizes scientific observation, analytical techniques, and communication of results. Prerequisite(s): PS 201 with a minimum grade of C & PS 202 and PS 205. Corequisite(s): PS 401

PS 452—History and Systems Laboratory

Lecture Hours: 0 **Lab Hours:** 3 **Credit Hours:** 1

A laboratory course for students participating in scientific research related to popular psychological myths and the classic studies that changed psychology. The lab emphasizes replication, scientific observation, analytical techniques, and communication of results. Prerequisite(s): PS 201 with a minimum grade of C & PS 202 and PS 205. Corequisite(s): PS 404

PS 491—Supervised Research I

Lecture Hours: 0 **Lab Hours:** 2-6 **Credit Hours:** 1-3

Normally a two-semester sequence for first class psychology majors who intend to pursue graduate studies. Each cadet will design and conduct an experiment under faculty supervision. Final presentation will include a paper in American Psychological Association format. Prerequisite(s): PS 201 with a minimum grade of C or permission of the department head.

PS 492—Supervised Research II

Lecture Hours: 0 **Lab Hours:** 2-6 **Credit Hours:** 103

Normally a two-semester sequence for first class psychology majors who intend to pursue graduate studies. Each cadet will design and conduct an experiment under faculty supervision. Final presentation will include a paper in American Psychological Association format. Prerequisite(s): PS 201 with a minimum grade of C or permission of the department head.

PS 495W—Independent Project in Leadership Studies

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Each student works under the close supervision of a faculty member on an independent problem related to leadership studies. Requires research and writing of substantial paper(s) and an oral examination in defense of the project. Note: PS 495 is a required course for the minor in Leadership Studies.

Writing Intensive Course (W). Prerequisite(s): PS 201 with a minimum grade of C, PS 344, and permission of the department head.

Physics

Department of Physics and Astronomy

Department Head: Col. Hodges

Requirements for a major in physics are specified in Physics and Astronomy.

PY 115—Laboratory for PY 120

Lecture Hours: 0 **Lab Hours:** 2 **Credit Hours:** 1

A laboratory course to investigate the concepts covered in PY 120. Computer generated graphs, spreadsheets, and regression analysis are required for most experiments. Corequisite(s): PY 120

PY 116—Laboratory for PY 121

Lecture Hours: 0 **Lab Hours:** 2 **Credit Hours:** 1

A laboratory course to investigate the concepts covered in PY 121. Computer generated graphs, spreadsheets, and regression analysis are required for most experiments. Corequisite(s): PY 121

PY 120—General Physics I

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Designed as an Algebra based terminal course in physics, this sequence is a survey of the concepts and theories of classical and modern physical science. (This course does not satisfy the core curriculum science requirement.) Corequisite(s): PY 115 or PY 155

PY 121—General Physics II

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Designed as an Algebra based terminal course in physics, this sequence is a survey of the concepts and theories of classical and modern physical science. (This course does not satisfy the core curriculum science requirement.) Prerequisite(s): PY 120 Corequisite(s): PY 116 or PY 156

PY 155—General Physics Laboratory I

Lecture Hours: 0 **Lab Hours:** 2 **Credit Hours:** 1

A laboratory course to investigate the concepts covered in PY 120 or PY 160. Computer generated graphs, spreadsheets, and regression analysis are required for most experiments. Note: Satisfies core curriculum science requirement. Corequisite(s): PY 120 or PY 160.

PY 156—General Physics Laboratory II

Lecture Hours: 0 **Lab Hours:** 2 **Credit Hours:** 1

A laboratory course to investigate the concepts covered in PY 121 or PY 161. Computer generated graphs, spreadsheets, and regression analysis are required for most experiments. Note: Satisfies core curriculum science requirement. Corequisite(s): PY 121 or PY 161.

PY 160—General Physics I

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This calculus-based sequence constitutes a general course in physics covering the topics of mechanics, thermodynamics, waves and sound, electricity and magnetism and optics. This sequence is for physics, chemistry, applied mathematics, and engineering majors. Note: Satisfies core curriculum science requirement. Prerequisite(s): MA 123 Corequisite(s): MA 123 and PY 155.

PY 161—General Physics II

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This calculus-based sequence constitutes a general course in physics covering the topics of mechanics, thermodynamics, waves and sound, electricity and magnetism and optics. This sequence is for physics, chemistry, applied mathematics, and engineering majors. Note: Satisfies core curriculum science requirement. Prerequisite(s): PY 160 Corequisite(s): PY 156

PY 222—Thermal/Fluid Sciences

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This is a first course in thermal-fluid sciences. The objective is to cover the basic principles of thermodynamics, fluid mechanics and heat transfer. Diverse real-world examples are presented to give students a feel for how thermal-fluid sciences are applied in practice. By emphasizing the physics and physical arguments, students are able to develop intuitive understanding of thermal-fluid sciences. Any cadet interested in a Navy commission should consider this course. This course is intended for majors other than ME.

PY 223—Programming and Data Analysis

Lecture Hours: 1 **Lab Hours:** 2 **Credit Hours:** 2

An introduction to some of the techniques and tools used by practicing physicists. Includes an introduction to MATLAB programming with emphasis on programming fundamentals,

standard input/output techniques, and data handling. Students learn how to use the Mathcad software program to do numerical analysis as well as symbolic calculations. Data and error analysis beyond the fundamentals is introduced and includes such topics as regression analysis, weighted averages, error propagation, and data analysis.

PY 253W—Optics Laboratory

Lecture Hours: 0 **Lab Hours:** 2 **Credit Hours:** 1

A laboratory course in which some of the experiments in classical optics, as well as some in the field of laser optics will be performed. Prerequisite(s): PY 161. Corequisite(s): PY 254. Writing Intensive (W).

PY 254—Optics

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A study of geometrical and physical optics, including properties of lens systems, superposition, interference, diffraction, polarization, an introduction to lasers and elementary fiber optics. Prerequisite(s): PY 161 Corequisite(s): PY 253W

PY 257—Electronics and Interfacing

Lecture Hours: 3 **Lab Hours:** 2 **Credit Hours:** 4

A course designed to teach the principles of microcomputer control of physics experiments. Course begins with an introduction to digital electronics, and a short review of analog electronics (op-amps, transistors), then proceeds to sensors, stepper motors, and microcontrollers for control of experiments. The rest of the course concentrates on learning LabVIEW and using it with a student-designed experiment, for automated control and data acquisition. Prerequisite(s): PY 262

PY 262—General Physics III

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

The third course in the calculus-based sequence of General Physics. Topics are Statics, Fluids, Kinetic Theory of Gasses, Gauss's Law, AC Circuits, Maxwell's Equations, and other topics. This course completes the sequence for Physics majors. Other majors could take this as an elective to complete the full Physics sequence. Prerequisite(s): PY 161

PY 291—Summer Research in Physics

Lecture Hours: 0 **Lab Hours:** 2-8 **Credit Hours:** 1-4

Independent research opportunities in physics and astronomy offered in the summer sessions. A student working under the supervision of a faculty mentor may earn up to four credit hours per summer session. An oral presentation and a comprehensive research paper are required. Prerequisite(s): permission of the department head and faculty research mentor.

PY 294—Summer Research in Physics

Lecture Hours: 0 **Lab Hours:** 2-8 **Credit Hours:** 1-4

Independent research opportunities in physics and astronomy offered in the summer sessions. A student working under the supervision of a faculty mentor may earn up to four credit hours per summer session. An oral presentation and a comprehensive research paper are required. Prerequisite(s): permission of the department head and faculty research mentor.

PY 308—Introduction to Nanotechnology

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A course designed to introduce the student to the multidisciplinary and rapidly developing field of nanotechnology. Topics include nanomaterials, micro/nanofabrication, microscopy, nanoelectronics, biological nanotechnology, nanoterrorism, social and ethical implications, etc. Prerequisite(s): PY 160 and PY 161

PY 333W—Modern Physics Laboratory

Lecture Hours: 0 **Lab Hours:** 2 **Credit Hours:** 1

A laboratory course to accompany PY 335—Modern Physics I. Elementary experiments in both atomic and nuclear physics will be performed. Corequisite(s): PY 335 Writing Intensive (W).

PY 334—Nuclear Physics Laboratory

Lecture Hours: 0 **Lab Hours:** 2 **Credit Hours:** 1

A laboratory course to accompany PY 344—Nuclear Physics. A number of more advanced nuclear physics laboratory experiments will be performed. Prerequisite(s): PY 333W and PY 335 Corequisite(s): PY 344

PY 335—Modern Physics I

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An introduction to the topics of modern physics to include the special theory of relativity including relativistic kinematics and dynamics, early quantum theory, wave-particle duality, the Uncertainty Principle, the Bohr atom, quantum mechanics, and atomic physics. Prerequisite(s): PY 161 Corequisite(s): PY 333W

PY 336—Modern Physics II

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An extension of PY 335, in which quantum mechanics is used to address a variety of topics in the areas of statistical physics, molecules and solids, and semiconductor devices. Other topics covered include nuclear models, radioactive decay, nuclear reactions, elementary particles, general relativity, and cosmology. Prerequisite(s): PY 335 Note: No lab associated with this course.

PY 341—Electricity and Magnetism I

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An intermediate level course in electricity and magnetism, designed for physics majors, which includes the theory of electrostatic and magneto static fields in space and matter, followed by electrodynamics and the development of the four Maxwell equations. Vector analysis extensively employed throughout the course. Prerequisite(s): PY 161 Corequisite(s): MA 301

PY 342—Electricity and Magnetism II

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An extension of PY 341, in which the Maxwell equations are used to address a variety of topics, to include energy in electromagnetic fields, electromagnetic waves, and the covariant formulation of electrodynamics, among others. Prerequisite(s): PY 341

PY 344—Nuclear Physics

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Nuclear structure, nuclear models, decay processes, reaction cross-sections, reaction kinematics, neutron dynamics, nuclear reactors, radiation detectors, nuclear accelerators, particle physics. Prerequisite(s): PY 161 Corequisite(s): PY 334

PY 345—Lasers and Their Applications

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course will introduce students to the fundamental physics associated with the design and operation of lasers. It is intended to be a "first course" that covers a fairly wide range of topics in laser physics at an introductory level. Although the course is not a laboratory course, we will take occasional trips to the instructor's research lab in order to illustrate concepts discussed in lecture. This course also has as one of its goals introducing students to various applications of lasers in science and technology. This will be accomplished through lecture and student presentations. Prior experience in programming in MATLAB or Mathematica is recommended. Prerequisite(s): PY 335

PY 345—Nuclear Radiation Detection

Lecture Hours: 2 **Lab Hours:** 2 **Credit Hours:** 3

Fundamental concepts of nuclear radiation, radiation detection, measurement techniques and some applications of nuclear technologies. Upon completion of the course and laboratory students are expected to classify various detectors; explain the physical principles of operation of various detectors; describe use of the detectors; review limits of detection for each detector; apply principles of counting statistics and error propagation to solve the problems related to accuracy, efficiency and limitations (errors) of the detection approaches covered in the course. Prerequisite(s): PY 161 or PY 121

PY 391—Summer Research in Physics

Lecture Hours: 0 **Lab Hours:** 2-8 **Credit Hours:** 1-4

Independent research opportunities in physics and astronomy offered in the summer sessions. A student working under the supervision of a faculty mentor may earn up to four credit hours per summer session. An oral presentation and a comprehensive research paper are required. Prerequisite(s): permission of the department head and faculty research mentor.

PY 394—Summer Research in Physics

Lecture Hours: 0 **Lab Hours:** 2-8 **Credit Hours:** 1-4

Independent research opportunities in physics and astronomy offered in the summer sessions. A student working under the supervision of a faculty mentor may earn up to four credit hours per summer session. An oral presentation and a comprehensive research paper are required. Prerequisite(s): permission of the department head and faculty research mentor.

PY 420—Capstone

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This is a one semester course for physics majors in which they will revisit the fundamentals of the main subfields of physics and will complete a research project in physics or astronomy. The group project, in an area chosen by the instructor, may be experimental, theoretical, observational, computational, or pedagogical in character and will result in a final report.

PY 441—Classical Mechanics I

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A study of the dynamics of particles and rigid bodies, damped, undamped, and driven harmonic oscillators, gravity and central force motion, the moment of inertia tensor and its diagonalization, and introduction to Lagrangian mechanics. Prerequisite(s): PY 160 and MA 311

PY 446—Thermal Physics

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A study of large-scale systems consisting of many atoms or molecules, providing an introduction to the subjects of statistical mechanics, kinetic theory, entropy, Fermi and Bose gases, the partition function, thermodynamics, semiconductor statistics, cryogenics and other selected topics. Prerequisite(s): PY 335.

PY 447—Thesis I

Lecture Hours: 0 **Lab Hours:** 2-8 **Credit Hours:** 1-4

Normally a two-semester sequence for first class physics majors, these courses are especially recommended for cadets who intend to pursue graduate studies. Each cadet is expected to investigate a simple research problem, either experimental or theoretical, and write a thesis summarizing the work.

PY 448—Thesis II

Lecture Hours: 0 **Lab Hours:** 2-8 **Credit Hours:** 1-4

Normally a two-semester sequence for first class physics majors, these courses are especially recommended for cadets who intend to pursue graduate studies. Each cadet is expected to investigate a simple research problem, either experimental or theoretical, and write a thesis summarizing the work.

PY 453—Nuclear Reactor Engineering

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An introduction to nuclear engineering to include a review of elementary atomic and nuclear physics, the interaction of radiation with matter, types of nuclear reactors, nuclear power, neutron dynamics, nuclear reactor theory, reactor shielding, and radiation protection. Prerequisite(s): PY 161. When Offered: Offered when the enrollment justifies.

PY 459—Introduction to Quantum Mechanics

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A rigorous study of the foundations of Quantum Mechanics. Topics include mathematical solutions to the Schroedinger equation, harmonic oscillator, Dirac notation, commutator relations and the hydrogen atom. Prerequisite(s): PY 335 and MA 301.

PY 460—Topics in Quantum Mechanics

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A seminar that is a continuation of the study of quantum concepts begun in PY 459. Discussion of topics of interest to the instructor and cadets. Prerequisite(s): PY 459. When Offered: (Offered when the enrollment justifies.)

PY 481—Topics in Physics

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Special topics in physics and astronomy as suggested by faculty or cadets. Subjects and content to be announced in advance. Prerequisite(s): first-class standing and permission of the department head. When Offered: Course(s) will not necessarily be offered every semester.

PY 491—Summer Research in Physics

Lecture Hours: 0 **Lab Hours:** 2-8 **Credit Hours:** 1-4

Independent research opportunities in physics and astronomy offered in the summer sessions. A student working under the supervision of a faculty mentor may earn up to four credit hours per summer session. An oral presentation and a comprehensive research paper are required. Prerequisite(s): permission of the department head and faculty research mentor.

PY 494—Summer Research in Physics

Lecture Hours: 0 **Lab Hours:** 2-8 **Credit Hours:** 1-4

Independent research opportunities in physics and astronomy offered in the summer sessions. A student working under the supervision of a faculty mentor may earn up to four credit hours per summer session. An oral presentation and a comprehensive research paper are required. Prerequisite(s): permission of the department head and faculty research mentor.

Spanish

Department of Modern Languages and Cultures

Department Head: Col. Sunnen

All cadets who enter with two or more entrance units in a modern foreign language are given placement tests and are placed in appropriate courses on the basis of the test results combined with their previous high school language coursework, and after consultation with the department head of modern languages.

A single year of a foreign language shall count toward meeting graduation requirements only when the cadet is studying a second language or is taking a language as an elective.

Cadets must demonstrate proficiency in ML 101 in order to be admitted into ML 102. They must, similarly, demonstrate proficiency in ML 102 before enrolling in ML 201, and in ML 201 before enrolling in ML 202/204. Proficiency in ML 202/204 is a prerequisite for admission to 300-level courses. Completion of two 300-level courses or their equivalent is expected before enrollment in any 400—level course. Once a cadet has completed work at the 202/204 level, he/she may not return to the elementary level course for credit.

Cadets who present four years of a high school language or demonstrate native or near-native language abilities may not enroll at the elementary level of that language. Such students will have the choice of enrolling either in the first semester intermediate level of that language or in the first semester elementary course of a different language.

SP 101—Elementary Spanish I

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An introduction to the fundamentals of Spanish. Primary emphasis on the acquisition of the basic language skills (comprehending, speaking, reading, and writing) within the context of civilization and culture. Secondary emphasis on the culture where Spanish is spoken. Intended for beginners with no previous experience in the language.

SP 102—Elementary Spanish II

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A continuation of SP 101. Prerequisite(s): SP 101.

SP 200WX—Spanish in the STEM Professions

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A low intermediate level, project-based course focused on the development of communicative and global competencies for the STEM professions. This course is a terminal course and cannot be used toward the language requirement. Satisfies a humanities elective. Note: Writing Intensive and Civilizations & Cultures Course (WX). Prerequisite(s): SP 102.

SP 201—Intermediate Spanish I

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A systematic review of grammar and the readings of texts of significant literary, cultural or historical value. Composition, aural and oral work continued. Prerequisite(s): SP 102.

SP 202—Intermediate Spanish II

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A continuation of SP 201. Prerequisite(s): SP 201.

SP 204X—Intermediate Spanish for Business

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A study of simple Spanish texts relevant to business and management practices and general social aspects of the Spanish-speaking world. This course provides a cultural and technical background. Students who successfully complete SP 204X will receive credit for fourth-semester Spanish (equivalent to SP 202). Note: SP 204X is a terminal course. Cadets who continue on to 300-level Spanish courses must complete SP 202 as a prerequisite for upper level Spanish. Prerequisite(s): SP 201

SP 210X—Image and Meaning in Spanish Film

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Film-making in Spain since 1980 within the dual contexts of Spanish film history and film theory. This course does not include a foreign language component and cannot be used toward a language requirement. Note: Cadets may not earn credit for both SP 210X and SP 310X

SP 299X—Summer Abroad in Spain

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A summer cultural immersion study in Spain that includes language instruction appropriate with the individual student's level. All coursework is in English, although students receive some instruction in basic Spanish expression to help them complete the learning modules. This course is not applicable towards a foreign language requirement stipulated by various majors. Prerequisite(s): None. When Offered: It is only offered in some summers. Civilizations and Cultures (X).

SP 302—Spanish for the Military and Defense

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Spanish for Diplomacy and Defense is a proficiency-based course focused on communication and cultural protocols with colleagues, associates, and native populations in or from Spanish-speaking countries. It specifically responds to what the US Army Cadet Command identifies as "[...] the need for young leaders to develop more cultural awareness and foreign language proficiency skills." Prerequisite(s): SP 202

SP 303W—Spanish Composition and Conversation

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Designed for students who wish to gain a command of spoken and written Spanish. Taught in Spanish. Prerequisite(s): SP 202 Writing Intensive (W).

SP 305—Survey of Spanish Literature I

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A survey of Spanish literature from the beginning through the 17th century, with selected readings from the major authors, literary movements, and genres. Conducted in Spanish. Prerequisite(s): one 300-level Spanish course.

SP 306—Survey of Spanish American Literature II

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A survey of Spanish American literature with selected readings from the major authors, literary movements, and genres. Taught in Spanish. Prerequisite(s): one 300-level Spanish course.

SP 310X—The "Big Screen" in Democratic Spain

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Film making in Spain since 1980 within the dual contexts of Spanish film history and film theory. Taught in Spanish. Note: Cadets may not earn credit for both SP 210X and SP 310X Prerequisite(s): one 300-level Spanish course.

SP 311—Human Rights and the Hispanic Writer

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Human Rights as seen by Spanish, Latin American, and U.S. Hispanic writers. Texts include essay, narrative, poetry, film, fine art, and other cultural media. Prerequisite(s): Completion of SP 202 or SP 204X and completion of ERH 102 with a minimum grade of C.

SP 312—Culture and Civilization of Spain

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A study of Spain's cultural identity from prehistoric to contemporary times including artistic, literary, political, and societal artifacts. Taught in Spanish. Prerequisite(s): one 300-level Spanish course.

SP 313—Advanced Spanish Grammar

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A study of Spanish grammar and syntax with special emphasis on the study of idiomatic expressions. Readings incorporate grammatical review of more challenging structures that prepare students for advanced work. Prerequisite(s): Completion of SP 202

SP 314—Latin American Cultures and Civilizations

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An overview of the history, art, literature, society, educational and legal systems, and values of Latin America. Texts chosen from newspapers, original documents. Emphasis on Writing and Conversation. Taught in Spanish. Prerequisite(s): one 300-level Spanish course.

SP 315—Introduction to Hispanic Texts

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A course designed to build on the reading skills acquired in intermediate Spanish by presenting texts drawn from many fields of interest: politics, business, literature, history. Taught in Spanish. Emphasis will be placed on reading and writing skills. Prerequisite(s): SP 202

SP 316—Topics in Spanish

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

The topics will vary to reflect cadet and professorial interests. The goal of this course is to provide information and foster discussion of diverse topics from the Hispanic world and to reinforce language skills. Taught in Spanish. Note: Retakes for credit. Prerequisite(s): one 300-level Spanish course.

SP 318—Nobel Laureates

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An introduction to the writings of major authors of the 20th century Hispanic literature. Students gain an overview of Spanish and Latin American Nobel Prize winners and read drama, poetry, narrative, and essay. Emphasizes speaking and writing. Taught in Spanish. Prerequisite(s): one 300-level Spanish course.

SP 320W—Spanish Gothic Literature

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A study of representative Spanish gothic tales with the aim of reinforcing and expanding the basic languages skills of speaking, reading, understanding, and writing. Taught in Spanish. Prerequisite(s): one 300-level Spanish course. Writing Intensive Course (W).

SP 321X—Across the Atlantic: Arabic Roots from Spain to Spanish-America

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Examines the geographic significance of the Berber-Arab-Jewish-Morisco and Spanish speaking worlds on a variety of levels. Starting from the historic heritage from the al Andalus era (711-1032 AD), the course moves to the intersection of the "developing" and "developed" world in Spanish-America. Focus on the relationship of Islamic diasporas, from the perception of terrorism, to the new left ideology in Spanish-America. Prerequisite(s): one 300-level Spanish course. Civilizations & Cultures Course (X).

SP 322—Hispanic Cinema

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An introduction to Spanish-language films and Hispanic film directors as well as the cultural, political, economic, and social backgrounds of the films viewed. Taught in Spanish. Prerequisite(s): one 300-level Spanish course.

SP 387X—The Spanish Civil War As Text (in English)

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course focuses on the cultural production of the Spanish Civil War. Cadets analyze Spanish cultural perspectives regarding the conflict using classical modes of writing and technology. This course does not include a foreign language component and cannot be used toward a language requirement. Cadets may not earn credit for both SP 387 and SP 388W. Note: **Civilizations & Cultures Course**. Prerequisite(s): ERH 102 with a minimum grade of C.

SP 388W—The Spanish Civil War As Text

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course focuses on the cultural production of the Spanish Civil War. Cadets analyze cultural perspectives regarding the conflict using classical modes of writing and technology. Cadets may not earn credit for both SP 387X and SP 388. Note: **Writing Intensive Course**. Prerequisite(s): one 300-level Spanish course and ERH 102 with a minimum grade of C.

SP 399X—Summer Abroad in Spain

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A summer cultural immersion study in Spain that includes language instruction at the post-intermediate level. Instruction and coursework are in Spanish. Prerequisite(s): SP 202 When Offered: It is only offered in some summers. Civilizations & Cultures (X).

SP 402—Spanish Literature of the Siglo De Oro

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An introduction to the poetry, prose, and comedia of Spain's Golden Age. Conducted in Spanish. Research paper required. Prerequisite(s): two 300-level courses or their equivalent.

SP 405—Readings in Hispanic Literature

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Directed readings of major literary works; written reports and a research paper required. Taught in Spanish. Note: Retakes for credit. Prerequisite(s): permission of the department head.

SP 406—Readings in Hispanic Literature

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Directed readings of major literary works; written reports and a research paper required. Taught in Spanish. Note: Retakes for credit. Prerequisite(s): permission of the department head.

SP 409—Early Spanish Literature

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A study of medieval Spanish poetry and prose, with an introduction to drama. Conducted in Spanish. Research paper required. Prerequisite(s): two 300-level SP courses.

SP 411—19th Century Peninsular Literature

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A cross-generational study of 19th century Peninsular works from perspectives of the author (19th century), film-maker (20th century), and reader/viewer (21st century). Readings from all

four major literary genres as well as online multimedia assignments focused principally on film adaptations of major works are required. Taught in Spanish. Prerequisite(s): two 300 level SP courses.

SP 421—Colonial Spanish American Literature

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A study of important Spanish American authors from the conquest to independence. Taught in Spanish. Research paper required. Prerequisite(s): two 300-level SP courses.

SP 422—Spanish American Literature of the 19th Century

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Literary and philosophical trends from the independence movement to Modernism. Taught in Spanish. Research paper required. Prerequisite(s): two 300-level SP courses.

SP 423—Spanish American Literature of the 20th Century

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Reading and analysis of representative works of the principal Spanish American novelists, poets, and dramatists from Modernism to the present. Taught in Spanish. Research paper required. Prerequisite(s): two 300-level SP courses.

SP 424—Narcos, Hitmen and Religion: Drug Trafficking Culture in Columbian Literature and Media

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

This course focuses on drug trade violence in Colombian literature and media as evidenced in the narconovela. Students examine materials treating cultural, social, political, and ethical dilemmas. Conducted primarily in SPANISH. Prerequisite(s): two 300-level SP courses

SP 425—Cervantes

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Study and analysis of Cervantes' major works, with emphasis on Don Quijote de la Mancha and how Cervantes' life and personality shaped his literary production. Taught in Spanish. Research paper required. Prerequisite(s): two 300-level SP courses.

SP 426—Contemporary Spanish Literature I

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A study of Peninsular literature from 1898 through 1960. Works chosen reflect the literary trends of the era as well as the social and cultural attitudes shaped by historical events. Taught in Spanish. Research paper required. Prerequisite(s): two 300-level SP courses.

SP 427—Contemporary Spanish Literature II

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A study of Peninsular literature from the second part of Franco's dictatorship (c1960) through contemporary times. Works chosen reflect both the literary trends of the era as well as the socio-historical and cultural attitudes of Spain as it underwent the transition from dictatorship to democracy and to membership in the European Economic Community. Taught in Spanish. Prerequisite(s): Two 300-level SP courses.

SP 450—Modern Language Capstone Course

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

The student will choose a topic incorporating an analysis of historical, literary or cultural factors in the major language area—field experience and interdisciplinary topics are strongly encouraged. Upon approval of the faculty adviser, the student will prepare both a research paper and a 20-minute oral presentation. This course is only open to first and second class Modern Language majors and minors. The ML Capstone project will be written in the student's major foreign language, as appropriate, and it will achieve a language rating of "Advanced-High". All relevant documentation will adhere to MLA specifications. An accepted ML Honors Thesis could substitute for this course.

SP 470—Special Topics in Spanish

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

An advanced topics course that will vary to reflect cadet and professorial interests. This course fosters a close reading of text and discussion of diverse topics from the Hispanic world to reinforce advanced language and cultural knowledge. Prerequisite(s): two 300-level courses or their equivalent.

SP 481—Survey of Spanish Culture & Society

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

A history and civilization course during the VMI summer abroad program in Spain or Spanish America. This course is primarily a culture class designed to educate students on Spanish or Spanish American history through on-site excursions to historical places of interest with a guided tour. The course includes invited guest lectures by academics. Topics cover society such as the educational system, government relations, religion, history, superstitions, and gender roles, among others. This course does not include a foreign language component and cannot be used toward a language requirement.

Catalog Electives

BI Capstone—Capstone Experience
Credit Hours: 3

Please refer to your program evaluation for valid courses which fall into this designation.

BI Core—Core Area Elective
Credit Hours: 3

Please refer to your program evaluation for valid courses which fall into this designation

BI Core—Core Area Elective
Credit Hours: 4

Please refer to your program evaluation for valid courses which fall into this designation.

BI Core—Core Area Elective
Credit Hours: 3 or 4

Please refer to your program evaluation for valid courses which fall into this designation.

BI Core—Core Area Elective
Credit Hours: 3

Please refer to your program evaluation for valid courses which fall into this designation.

BI Core—Core Area Elective
Credit Hours: 4

Please refer to your program evaluation for valid courses which fall into this designation.

BI Core—Core Area Elective
Credit Hours: 3

Please refer to your program evaluation for valid courses which fall into this designation.

BI Elective—Non-Science Elective
Credit Hours: 3

Please refer to your program evaluation for valid courses which fall into this designation

BI Elective—Non-Science Elective
Credit Hours: 3

Please refer to your program evaluation for valid courses which fall into this designation.

BI Elective—Non-Science Elective
Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Please refer to your program evaluation for valid courses which fall into this designation.

BU ELEC—Business Elective
Credit Hours: 3

Please refer to your program evaluation for valid courses which fall into this designation.

CE ELEC—Design Elective
Credit Hours: 3

Please refer to your program evaluation for valid courses which fall into this designation.

CE ELEC—Engineering Science Elective I
Credit Hours: 3

Please refer to your program evaluation for valid courses which fall into this designation.

CE ELEC—Engineering Science Elective II
Credit Hours: 3

Please refer to your program evaluation for valid courses which fall into this designation.

CE ELEC—Natural Science (GE 306 or BI 101)
Credit Hours: 4

Please refer to your program evaluation for valid courses which fall into this designation.

CE ELEC—Technical Elective
Credit Hours: 3

Please refer to your program evaluation for valid courses which fall into this designation.

CE ELEC—Technical Elective
Credit Hours: 3

Please refer to your program evaluation for valid courses which fall into this designation.

CH Elective—Concentration Elective
Credit Hours: 3

Please refer to your program evaluation for valid courses which fall into this designation.

CH Requirement—Advanced Chemistry Course
Credit Hours: 3

Please refer to your program evaluation for valid courses which fall into this designation.

CH Requirement—Advanced Chemistry Laboratory
Credit Hours: 1.5–3

Please refer to your program evaluation for valid courses which fall into this designation.

EC ELEC—Economics Elective
Credit Hours: 3

Please refer to your program evaluation for valid courses which fall into this designation.

EC ELEC—Economics Elective
Credit Hours: 3

Please refer to your program evaluation for valid courses which fall into this designation.

ECE ELEC—Electrical & Computer Engineering Elective
Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Please refer to your program evaluation for valid courses which fall into this designation.

ECE ELEC—Electrical & Computer Engineering Elective
Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Please refer to your program evaluation for valid courses which fall into this designation.

ECE ELEC—Electrical & Computer Engineering Elective

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Please refer to your program evaluation for valid courses which fall into this designation.

ELEC BI—Biology Elective

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Please refer to your program evaluation for valid courses which fall into this designation.

ELEC CIS—Computer & Information Sciences Elective

Credit Hours: 3

Please refer to your program evaluation for valid courses which fall into this designation.

ELEC CIS—Computer & Informations Sciences Elective

Credit Hours: 3

Please refer to your program evaluation for valid courses which fall into this designation.

ELEC ERH—ERH Elective

Credit Hours: 3

Please refer to your program evaluation for valid courses which fall into this designation.

ELEC Foreign Language—Foreign Language Elective

Credit Hours: 3

Please refer to your program evaluation for valid courses which fall into this designation.

ELEC Free—Free Elective

Credit Hours: 3

Please refer to your program evaluation for valid courses which fall into this designation.

ELEC Free—Free Elective

Credit Hours: 3

Please refer to your program evaluation for valid courses which fall into this designation.

ELEC Free—Free Elective

Credit Hours: 3

Please refer to your program evaluation for valid courses which fall into this designation.

ELEC Free—Free Elective

Credit Hours: 4

Please refer to your program evaluation for valid courses which fall into this designation.

ELEC Free—Free Elective

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Please refer to your program evaluation for valid courses which fall into this designation.

ELEC Free—Free Elective

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Please refer to your program evaluation for valid courses which fall into this designation.

ELEC Free—Free Elective (2 Credits)

Credit Hours: 2

Please refer to your program evaluation for valid courses which fall into this designation.

ELEC Free—Free Electives

Credit Hours: 9-11.5

Please refer to your program evaluation for valid courses which fall into this designation.

ELEC Free—Free Electives

Credit Hours: 11

Please refer to your program evaluation for valid courses which fall into this designation.

ELEC HI—History Elective

Credit Hours: 3

Please refer to your program evaluation for valid courses which fall into this designation.

ELEC Humanities—Humanities Elective

Credit Hours: 3

Please refer to your program evaluation for valid courses which fall into this designation.

ELEC IS—International Studies Elective

Credit Hours: 3

Please refer to your program evaluation for valid courses which fall into this designation.

ELEC MA/SC—Mathematics or Science Elective

Credit Hours: 3

Please refer to your program evaluation for valid courses which fall into this designation.

ELEC MA/SC—Mathematics or Science Elective

Credit Hours: 4

Please refer to your program evaluation for valid courses which fall into this designation.

ELEC Major—Major Elective

Credit Hours: 3

Please refer to your program evaluation for valid courses which fall into this designation.

ELEC Major—Major Elective

Credit Hours: 3

Please refer to your program evaluation for valid courses which fall into this designation.

ELEC Major—Major Elective

Credit Hours: 4

Please refer to your program evaluation for valid courses which fall into this designation.

ELEC Mathematics—Mathematics Elective

Credit Hours: 3

Please refer to your program evaluation for valid courses which fall into this designation.

ELEC Mathematics—Mathematics Elective

Credit Hours: 3

Please refer to your program evaluation for valid courses which fall into this designation.

ELEC Non-HI—Non-History Elective

Credit Hours: 3

Please refer to your program evaluation for valid courses which fall into this designation.

ELEC PS—Psychology Elective

Lecture Hours: 3 **Lab Hours:** 0 **Credit Hours:** 3

Please refer to your program evaluation for valid courses which fall into this designation.

ELEC Restricted—(ERH, EC, or IS)

Credit Hours: 3

Please refer to your program evaluation for valid courses which fall into this designation.

ELEC Restricted—Restricted Elective

Credit Hours: 3

Please see your academic advisor for valid courses which fall into this designation.

ELEC Science—Elective (Biology, Chemistry or Physics w/ lab)

Credit Hours: 4

Please refer to your program evaluation for valid courses which fall into this designation.

ELEC Science—Elective (Biology, Chemistry or Physics w/ lab)

Credit Hours: 4

Please refer to your program evaluation for valid courses which fall into this designation.

ELEC Science—Science Elective

Credit Hours: 4

Please refer to your program evaluation for valid courses which fall into this designation.

ELEC Science—Science Elective

Credit Hours: 3

Please refer to your program evaluation for valid courses which fall into this designation.

ELEC World—World Elective*

Credit Hours: 3

Please refer to your program evaluation for valid courses which fall into this designation.

HI Requirement—HI 324 or HI 325 or IS 310

Credit Hours: 3

Please refer to your program evaluation for valid courses which fall into this designation.

MA-SCI/FREE ELEC—3

Lecture Hours: 0 **Lab Hours:** 3

Please refer to your program evaluation for valid courses which fall into this designation.

ME ELEC—2nd Technical Elective

Credit Hours: 3

Please refer to your program evaluation for valid courses which fall into this designation.

ME ELEC—Technical Elective

Credit Hours: 3

Please refer to your program evaluation for valid courses which fall into this designation.

ML Capstone—Capstone Elective

Credit Hours: 3

Please refer to your program evaluation for valid courses which fall into this designation.

ML Requirement—Foreign Language 100-level

Credit Hours: 3

Please refer to your program evaluation for valid courses which fall into this designation.

ML Requirement—Foreign Language 200-level

Credit Hours: 3

Please refer to your program evaluation for valid courses which fall into this designation.

ML Requirement—Foreign Language 300-level

Credit Hours: 3

Please refer to your program evaluation for valid courses which fall into this designation.

ML Requirement—Foreign Language 300-level

Credit Hours: 3

Please refer to your program evaluation for valid courses which fall into this designation.

ML Requirement—Foreign Language 400-level

Credit Hours: 3

Please refer to your program evaluation for valid courses which fall into this designation.

PE Requirement—Elective

Credit Hours: 0.5

Please refer to your program evaluation for valid courses which fall into this designation.

PS Core—PS Core A

Credit Hours: 3

Please refer to your program evaluation for valid courses which fall into this designation.

PS Core—PS Core B

Credit Hours: 3

Please refer to your program evaluation for valid courses which fall into this designation.

PS Core—PS Core C

Credit Hours: 3

Please refer to your program evaluation for valid courses which fall into this designation.

PS Core—PS Core D

Credit Hours: 3

Please refer to your program evaluation for valid courses which fall into this designation.

PS Core—PS Core D

Credit Hours: 3

Please refer to your program evaluation for valid courses which fall into this designation.

PS LAB—PS Lab

Lecture Hours: 0 **Lab Hours:** 1 **Credit Hours:** 1

Psychology Lab

PY ELEC—Nuclear Energy Elective

Please refer to your program evaluation for valid courses which fall into this designation.

PY ELEC—Physics Elective

Credit Hours: 3

Please refer to your program evaluation for valid courses which fall into this designation.

PY ELEC—Technical Elective

Credit Hours: 3

Please refer to your program evaluation for valid courses which fall into this designation.

ROTC Requirement—AS, MS, or NS

Credit Hours: 1

Please refer to your program evaluation for valid courses which fall into this designation.

ROTC Requirement—AS, MS, or NS

Credit Hours: 2

Please refer to your program evaluation for valid courses which fall into this designation

Science Requirement—(BI, CH, or PY w/ lab)

Credit Hours: 4

Please refer to your program evaluation for valid courses which fall into this designation.

Science Requirement—Core

Credit Hours: 4

Please refer to your program evaluation for valid courses which fall into this designation.

Personnel of the Institute

The Honorable Ralph Northam '81, Governor of Virginia

Board of Visitors 2019-2020

Terms expire June 30, 2020

George J. Collins '62, Guilford, Connecticut
Charles E. Dominy, Oakton, Virginia
Scot W. Marsh '81, Winchester, Virginia
Carl A. Strock '70, Hustle, Virginia

Terms expire June 30, 2021

J. William Boland '73, Richmond, Virginia
Hugh M. Fain, III '80, Richmond, Virginia
Thomas R. Watjen '76, Key Largo, Florida
Frances C. Wilson, Virginia Beach, Virginia

Terms expire June 30, 2022

Thomas E. Gottwald '83, Richmond, Virginia
Conrad M. Hall '65, Norfolk, Virginia
Richard K. Hines V '66, Atlanta, Georgia
Hon. Joe R. Reeder, Alexandria, Virginia

Terms expire June 30, 2023

Lara Tyler Chambers '03, Manakin Sabot, Virginia
Michael Hamlar, Roanoke, Virginia
David L. Miller '70, Brentwood, Tennessee
Eugene Scott, Jr. '80, Richmond, Virginia

Member of the Board Ex Officio

Maj. Gen. Timothy P. Williams, The Adjutant General of Virginia

Officers of the Board 2019—2020

J. William Boland '73, President, Richmond, Virginia
David L. Miller '70, Vice President, Brentwood, Tennessee
Carl A. Strock '70, Vice President, Hustle, Virginia
Thomas R. Watjen '76, Vice President, Key Largo, Florida

Administration and Staff 2019-2020

J.H. Binford Peay III, Gen., USA (Ret.), Superintendent. B.S., Virginia Military Institute; M.A., George Washington University.

Robert W. Moreschi, Brig. Gen., Deputy Superintendent for Academics and Dean of the Faculty. B.A., Augustana College; M.S., Ph.D., University of Illinois. (2002; 2018)

Josiah Bunting III, Lt. Gen., Superintendent Emeritus. B.A., Virginia Military Institute; B.A. and M.A., Oxford University; D.Litt. (Hon.) Hampden-Sydney College; D. Litt. (Hon.), Washington College; L.H.D. (Hon.), Catawba College.

John W. Knapp, Lt. Gen., USA (Ret.), Superintendent Emeritus. B.S., Virginia Military Institute; M.S., Ph.D., Johns Hopkins University; Professional Engineer.

Grace Abele, Site Director, Stonewall Jackson House.

Eric M. Arnesen, Assistant Commandant for Support. B.A., Virginia Military Institute.

Corey J. Bachman, Capt., Virginia Militia, Assistant Commandant for Support. B.A., Virginia Military Institute; M.B.A., Bloomsburg University.

Charles H. Barber, Cmdr., USN (Ret.), Assistant Commandant for Training Support Activities, Commandant's Office. B.A., Franklin and Marshall College; M.S.A., George Washington University; Ed.S., University of Virginia.

Janet M. Battaglia, Col., Registrar. B.S., Assumption College; M.S., Drexel University.

Judith N. Baur, Assistant Registrar for Institutional Compliance. B.S., Pennsylvania State University; M.S., West Virginia University.

Christopher S. Bean, Sgt. 1st Class, USAR (Ret.), Battalion Operations and Training Sergeant. B.S., Pennsylvania State University.

Vernon L. Beitzel, Col., Director of Admissions. B.A., Virginia Military Institute; M.S., James Madison University.

Gary A. Bissell, Col., Deputy Chief of Staff and Operations. B.A., Virginia Military Institute; B.S., Kansas State University; M. Ed, Norwich University; MSS, Army War College.

William F. Bither, Lt. Col., Director of Corps Marksmanship and Head Women's and Men's Rifle Coach. B.S. North Georgia College; MSED, James Madison University.

Jeffrey R. Boobar, Col., Inspector General and Title IX Coordinator. B.A., Virginia Military Institute.

John A. Brodie, Col., Band Director. B.S., West Chester State University; M.M., D.M.A., Catholic University of America.

Dale R. Brown, Col., Institute Planning Officer. B.S., Norwich University; M.S., University of Alaska, Anchorage. Professional Engineer.

Kristi Marie Brown, Capt., MERC Tutor Supervisor. B.S., Bridgewater College.

Pamela S. Brown, Maj., Assistant Treasurer. B.S., West Virginia Institute of Technology; M.B.A., American Public University, CPA.

Lynn W. Carmack, Maj., Assistant Director, Procurement Services. B.B.A, M.B.A., Texas A&M University-Texarkana.

Ashley Carroll, Maj., Research and Instruction Librarian. B.A., Sweet Briar College; M.I.L.S.

Michelle P. Caruthers,Lt. Col., Director of Physical Plant. B.S., Virginia Polytechnic Institute and State University. Professional Engineer.

John P. Casper, Maj., Associate Chaplain to the Corps of Cadets. B.A., Virginia Military Institute; M.A., M.Ed., Regent University.

Dallas B. Clark, Brig. Gen., Deputy Superintendent for Finance, Administration and Support. B.A., Virginia Military Institute; MBA, Virginia Commonwealth University.

H. Lee Clark, III, Lt. Col., USA (Ret.), Assistant Director of Auxiliary Services. B.A., Virginia Military Institute; M.P.A., Troy State University.

Kim V. Connolly, Maj., Assistant Director for Conferences, Programs, and Marketing, Center for Leadership and Ethics.

David L. Copeland, Institute Physician. B.A., Stephen F. Austin State University; M.A., Memphis State University; M.D., Case Western Reserve University Medical School.

Carmelo A. Echevarria, III, Sgt. 1st Class, USA (Ret.), Battalion Operations & Training Sergeant.

Robin Eldredge, Maj., Financial management Analyst. B.S., M.B.A., Old Dominion University.

Kevin Faust, Lt. Col., Assistant Commandant for Cadet Government. B.A., Virginia Military Institute; M.Ed., University of Massachusetts.

Michael P. Friski, Lt. Col., USAF (Ret.), Quartermaster, Military Store. B.S., Virginia Military Institute; MBA, Auburn University.

Patricia C. Fry, Maj., Institute Counselor. B.S., Sacred Heart University; M.A., Liberty University.

Keith E. Gibson, Col., Executive Director of Museum System. B.S., Virginia Military Institute.

David R. Gray, Col., Director of the Center for Leadership and Ethics. B.A., Western Illinois University; M.A., U.S. Army War College; M.A., Ph.D., Ohio State.

Aaron Groah, Maj., ODCC Project Manager. B.S., Virginia Tech; EIT (Engineer in Training).

David B. Hall, Col., U.S. Marine Corps (Ret.), Director of International Programs. B.A., Virginia Military Institute; M.A., Marine Corps Command & Staff College; M.A., Naval War College.

Heather Groves Hannan, Lt. Col., Assistant Library Director and Head of User Services. B.A., Earlham College; M.S.L.I.S., Catholic University of America.

Patricia Hardin, Assistant Director of International Programs. B.A. University of South Carolina; M.A. University of Illinois at Urbana-Champaign.

Sean P. Harrington, Lt. Col. (Ret.), Executive Assistant to the Superintendent and Secretary to the Board of Visitors. B.A., Virginia Military Institute; M.S., Troy University.

Janet S. Holly, Col., Research and Instruction Librarian. B.A., Georgian Court College; M.S., Drexel University.

Marthe Honts, Maj., Sponsored Programs Administrator. B.A., Washington and Lee University; M.S., University of Virginia.

Wayne J. Howe, Maj., Evening Officer-in-Charge and Director of Rugby.

Jessica L. Hyde, Maj., Assistant Director of Admissions. B.A., Mary Baldwin College; M.A., University of Richmond.

James P. Inman, Col., USA (Ret.), Chief of Staff. B.A., Virginia Military Institute; M.A., Louisiana State University; M.S., National War College.

Diane B. Jacob, Col., Library Director. B.A., James Madison University; M.A., Hollins University.

Thomas K. Jarvis, Col., Director of Construction. B.S., Virginia Military Institute.

Sarah L. Jones, Lt. Col., Director, Center for Cadet Counseling & Office of Disabilities Services. M.Ed., Virginia Commonwealth University; Psy.D., James Madison University.

Eleanor L. Kania, Maj., Human Resources Officer. B.S., California State University; M.B.A., University of Scranton.

Elizabeth A. Kocevar-Weidinger, Lt. Col., Head of Research and Instruction Services. B.A., Temple University; M.S.L.S., University of Texas at Austin; M.Ed., Frostburg State University.

Jeffrey S. Kozak, Maj., Head of Archives and Records Management. B.A., University of Virginia; M.L.I.S., University of California, Los Angeles.

Jeffrey L. Lawhorne, Col., Treasurer. B.S., Radford University. CPA.

Gary M. Levenson, Col., Deputy Commandant. B.S., Virginia Military Institute.

Patrick G. Looney, Deputy Director of the Center for Leadership and Ethics. M.S., Marymount University; M.M.S., Marine Corps University; M.A., Naval War College.

Stewart D. MacInnis, Col., Director of Communications and Marketing. B.A., Christopher Newport College; M.A. Hollins University.

Rachel Maderik, Maj., Systems and Technology Librarian. B.S., University of Maryland; M.S.L.S., Clarion University of Pennsylvania.

Sandra B. Manuel, Lt. Col., Bursar. B.B.A., James Madison University.

Michael L. Marshall, Chief, VMI Police. Bluefield College.

Troy D. Marshall, Lt. Col., Site Director/ VA Museum of the Civil War and New Market Battlefield State Historical Park. B.A., William and Mary; M.A., Oklahoma.

Christina R. McDonald, Col., Professor of English and Institute Director of Writing. B.A., Rollins College; Ph.D., Texas Christian University.

Robert L. McDonald, Col., Associate Dean for Academic Affairs and Professor of English. B.A., Winthrop College; M.A., East Tennessee State University; Ph.D., Texas Christian University.

Burt Mitchell, Maj., Pipe Band Director and Assistant Band Director.

Thomas A. Mortenson, Col., Associate Director of Admissions. B.S., University of Wisconsin-Stout.

Thomas R. Panko, Lt. Col., Head of Technical Services. B.S., MBA, University of Southern Mississippi.

Richard A. Parella, Lt. Col., Human Resources Director. B.S., U.S. Naval Academy; M.B.A., George Washington University.

Kimberly C. Parker, Col., Director of Government Relations. B.A., Sweet Briar College; M.A.R., M.Div., Liberty Baptist Theological Seminary.

Ronald D. Payne, Lt. Col., Construction Project Manager. M.S., University of Florida.

Todd A. Pegg, Lt. Col., VaARNG, Deputy Commandant for Operations, Plans, and Training. B.S., Virginia Military Institute; M.E., University of Virginia.

William L. Perry, Capt., Assistant Director of Admissions. B.A., Virginia Military Institute.

Sherry A. Phelps, Maj., Associate Registrar. B.A., M.B.A., Averett University.

Robert E. Phillips, Col., USA (Ret.), Institute Chaplain & Chaplain to the Corps of Cadets. B.A., Virginia Military Institute; M.Div., Southwestern Baptist Theological Seminary; M.S., Columbus State University; M.S.S., U.S. Army War College.

Brian L. Quisenberry, Capt., USN (Ret.), Director of Financial Aid. B.S., Virginia Military Institute; MBA, James Madison University.

E. Lee Rakes, Lt. Col., Director of Institute Assessment and Evaluation. B.S., M.S., Ph.D., Virginia Tech.

Catherine M. Roy, Capt., Communications and Marketing Specialist, Center for Leadership and Ethics. B.A., Averett University; A.S., ECPI.

Suzanne D. Rubenstein, Command Sgt. Maj., USAR (Ret.), Director of Activities. B.A., Kean University; M.A., American Intercontinental University.

Kevin A. Ryan, Lt. Col., Comptroller. B.A., Virginia Military Institute; M.S., Old Dominion University; CPA.

Mary E. Schriver, Capt., Assistant Director of Admissions. B.A., Virginia Military Institute.

Michael J. Sebastino, Capt., USN (Ret.), Associate Dean of Academic Administration & Planning. B.A., The Citadel; M.B.A., Old Dominion University.

David G. Sigler, Maj., Assistant Director of Financial Aid. B.S., Washington and Lee University; M.Ed., Millersville University.

Isaac D. Slone, Capt., Director of the Corp Physical Training Facility. B.S., Ferrum College; M.B.A., Salem International University.

William T. Sowers, Sgt. Maj., USMC (Ret.), Institute and Corps Sergeant Major.

Christopher Terapane, Maj., Assistant Comptroller. B.S., Longwood University, CGSM.

Kathleen H. Tomlin, Lt. Col., Director of Procurement Services. B.A., Mary Baldwin College; M.A., Hollins University.

Leonard B. Vaughn, Maj., Information Technology Security Officer. M.S., Virginia Tech.

Kyle C. Volant, Capt., Physical Plant Project Manager. B.S., Virginia Military Institute.

William J. Wanovich, Col., USA (Ret.), Commandant of Cadets. B.A., Virginia Military Institute; M.S.S., U.S. Army War College.

Neil D. Whitmore, Lt. Col., Associate Director of Admissions. B.A., Virginia Military Institute.

David P. Williams, Col., Director of Auxiliary Services. B.S., Virginia Tech.

James L. Williams, Jr., Col., Post Engineer. B.S., Virginia Military Institute; M.S., Troy State University; Professional Engineer, EFP.

The Faculty 2019-2020

Academic and military ranks in the Virginia Militia, unorganized, correspond as follows:

Professor—Colonel, Captain

Associate Professor—Lieutenant Colonel, Commander

Assistant Professor—Major, Lieutenant Commander

Instructor—Captain, First Lieutenant, and Second Lieutenant, Lieutenant, Lieutenant (Junior Grade), Ensign

The first date within the parentheses indicates first appointment at VMI; the second indicates date of present faculty rank.

J. Shawn Addington, Col., Professor and Head of Electrical and Computer Engineering. B.S., M.S., Ph.D., Virginia Polytechnic Institute and State University. Professional Engineer. (1996; 2004)

Tanjina Afrin, Assistant Professor of Civil & Environmental Engineering. B.S., M.S., Bangladesh University of Engineering & Technology; Ph.D., Clemson University. (2017; 2017)

Reshef Agam-Segal, Associate Professor of Philosophy. B.A., M.A., Hebrew University of Jerusalem; Ph.D., University of Oxford. (2012; 2018)

Anne B. Alerding, Lt. Col., Associate Professor of Biology. B.S. Queen's University; M.S. University of British Columbia; Ph.D. Pennsylvania State University. (2008; 2014)

Denis A. Aliyev, Dr., Assistant Professor of Applied Mathematics. B.S., Tashkent State Technical University; M.S., Ph.D., Bowling Green State University. (2019; 2019)

Samuel K. Allen, Col., Professor of Economics and Business. B.A., Elon University; Ph.D., University of Arizona. (2006; 2016)

Elena Andreeva, Lt. Col., Associate Professor of History. B.A., M.A., Moscow State University; Ph.D., New York University. (2000; 2006)

Jochen Arndt, Maj., Assistant Professor of History. Diplom-Betriebswirt, Baden-Wurttemberg Cooperative State University, Germany; M.A., Stephen F. Austin State University; Ph.D., University of Illinois at Chicago. (2016; 2016)

James H. Arthur, Col., Professor of Mechanical Engineering. B.S., M.S., Ph.D., University of Virginia. Professional Engineer. (1988; 1998)

Mary Stewart Atwell, Maj., Assistant Professor of English. B.A., Hollins University; M.A., University of Virginia; M.F.A., Ph.D., Washington University in St. Louis. (2015; 2015)

Mohamed Azab, Dr, Assistant Professor of Computer and Information Sciences. B.S., M.S., Arab Academy of Science and Technology and Maritime Transport; Ph.D., Virginia Tech. (2018; 2018)

James M. Baker, Jr., Col., Professor of Electrical and Computer Engineering. B.S., M.S., Virginia Polytechnic Institute and State University; Ph.D., Georgia Institute of Technology. (2004; 2007)

Spencer D. Bakich, Lt. Col., Associate Professor of International Studies and Director of the National Security Minor. B.A., James Madison University; M.A., Ph. D., University of Virginia. (2016; 2016)

Atin Basuchoudhary, Col., Professor of Economics and Business and Holder of the John W. and Jane M. Roberts Institute Professorship in Free Market Economics. B.Sc., Calcutta University; M.B.A., Xavier Labor Relations Institute; Ph.D., University of Mississippi. (1998; 2008)

Daniel A. Baur, Maj., Assistant Professor of Physical Education. B.S., University of Pittsburgh; M.S., James Madison University; Ph.D., Florida State University. (2019; 2019)

Katherine G. Baur, Capt., Instructor of Physical Education. B.S., James Madison University; M.S., Florida State University (2017; 2017)

Wade E. Bell, Col., Professor and Head of Biology, Director of Research, VMI Research Laboratories, Inc. B.S., M.Ag., University of Florida; Ph.D., University of Vermont. (1998; 2008)

Joseph R. Blandino, Col., Professor of Mechanical Engineering and Holder of the Benjamin H. Powell, Jr. '36 Institute Professorship in Engineering. B.S., University of Massachusetts-Lowell; M.S., Ph.D., University of Virginia. Professional Engineer. (2007; 2007)

Joyce K. Blandino, Maj., Assistant Professor of Mechanical Engineering. B.S., University of Illinois; Ph.D., University of Virginia. (2010; 2010)

Karen M. Bliss, Lt. Col., Associate Professor of Applied Mathematics. B.S., University of Missouri-Rolla; M.S., Ph.D., North Carolina State University. (2015; 2019)

Kevin L. Braun, Maj., Assistant Professor of Chemistry. B.S., Beloit College; Ph.D., University of Arizona. (2018; 2018)

George M. Brooke, IV, Col., Professor of Physics. B.S., Virginia Military Institute; M.S., Ph.D., Old Dominion University. (2004; 2015)

Julie P. Brown, Lt. Col., Associate Professor of English and Fine Arts. B.A., M.A., University of Pennsylvania; M.A., M.F.A., Ph.D., Cornell University. (2013; 2013)

Kathleen D. Bulger-Barnett, Col., Professor of Modern Languages and Cultures. B.A., Radford University; M.A., Ph.D., University of Kentucky. (1989; 2001)

Abbey Carrico, Maj., Assistant Professor of Modern Languages. B.A., University of Richmond; M.A., Virginia Tech; Ph.D., Emory University. (2013; 2013)

Lucas C. Castle, Maj., Post-Doctoral Fellow of Applied Mathematics, B.S., Lamar University; M.S., Ph.D., North Carolina State University. (2018; 2018)

John E. Cerkey, Col., Professor of Modern Languages and Cultures, B.A., M.A., Ph.D., University of Kansas. (1992; 2002)

Dimplekumar N. Chalishajar, Col., Professor of Applied Mathematics. B.S., M.S., M. Phil., Ph.D., University of Buroda. (2011; 2018)

Amy G. Chapman, Maj., Assistant Professor of Applied Mathematics. B.S., M.S., Virginia Tech; Ph.D., Rensselaer Polytechnic Institute. (2015; 2015)

Tiffany S. Chu, Maj., Assistant Professor of International Studies and Political Science. B.A., University of California-Berkeley; M.A., Ph.D., University of Arizona. (2019; 2019)

James A. Coale, Col., Professor and Head of Physical Education. B.S., Springfield College; M.A., James Madison University; Ph.D., University of Maryland. (1978; 1993)

Bradley L. Coleman, Col., Associate Professor of History, Holder of the George J. Collins Chair in Military History and Director, John A. Adams '71 Center for Military History and Strategic Analysis. B.A., Virginia Military Institute; M.A., Temple University; Ph.D., University of Georgia. (2012; 2018)

Geoffrey W. Cox, Lt. Col., Associate Professor of Applied Mathematics. M.S., Ph.D., University of California at Irvine. (2010; 2016)

John A. David, Lt. Col., Associate Professor of Applied Mathematics. B.S., University of North Carolina, M.S., Ph.D., North Carolina State University. (2011; 2018)

Mary Ann Dellinger, Col., Professor of Modern Languages and Cultures. B.A., University of New Mexico; M.A., Ph.D., Arizona State University. (2001; 2008)

Valentina P. Dimitrova-Grajzl, Lt. Col., Associate Professor of Economics and Business. B.A., Wittenberg University; M.A., University of Maryland, College Park; Ph.D., University of Maryland, College Park. (2011; 2015)

Timothy Dowling, Col., Professor of History. B.S., Texas Christian University; M.A., University of Virginia; M.A. (Ed), College of New Jersey; Ph.D., Tulane University. (2001; 2013)

Patrick J. Eichholz, Maj., Assistant Professor of English. B.A., University of Dallas; Ph.D., University of North Carolina—Chapel Hill. (2018; 2018)

Mohamed Y. Eltoweissy, Col., Professor and Head of Computer and Information Sciences. B.S., M.S., Alexandria University, Egypt; Ph.D., Old Dominion University. (2014; 2014)

Dennis M. Foster, Col., Jackson-Hope Distinguished Professor and Head of International Studies and Political Science. B.A., Farleigh Dickinson University; M.A., Ph.D., Pennsylvania State University. (2004; 2014)

Scott T. Frein, Col., Professor of Psychology. B.A., Furman University; M.S., Clemson University; M.A., Ph.D., University of California, Davis. (2007; 2017)

Denise H. Young, Maj., Director of the Miller Academic Center. B.S. Radford University; M.A., Virginia Tech.

Jennifer E. Gerow, Lt. Col., Assistant Professor of Economics and Business, B.S., M.B.A., Ph.D., Clemson University. (2011; 2011)

James T. Gire, Col., Professor and Head of Psychology. B.Sc., University of Jos; M.Sc., London School of Economics; Ph.D., McMaster University. (1994; 1999)

Laura (Janelle) Gornick, Maj., Assistant Professor of Psychology. B.A., M.S., Ph.D., University of Montana. (2017; 2017)

Sook Ha, Maj., Assistant Professor of Computer and Information Sciences. B.S., MIT, Ph.D, Virginia Tech. (2015; 2015).

Jon-Michael Hardin, Col., Professor and Head of Mechanical Engineering. B.S., M.S., University of South Carolina; Ph.D., University of Illinois at Urbana-Champaign. (1998; 2009)

Daniel P. Harrison, Maj., Assistant Professor of Chemistry. B.S., Virginia Military Institute; Ph.D., University of Virginia. (2013; 2013)

Steven D. Hart, Lt. Col., Associate Professor of Civil & Environmental Engineering. B.S., United States Military Academy; M.E., Virginia Tech; Ph.D., Kansas State University. Professional Engineer. (2016; 2016)

Gregory N. Hartman, Col., Professor of Applied Mathematics. B.S., Liberty University; M.S., Ph.D., Virginia Tech. (2005; 2015)

Meagan C. Herald, Lt. Col., Associate Professor of Applied Mathematics & Interim MERC Director, B.S., Metro State College of Denver; M.S., Ph.D., University of Utah. (2008; 2014)

Vera Heuer, Dr., Associate Professor of International Studies and Political Science. M.A., Free University Berlin; M.A., Ph.D., Indiana University. (2013; 2019)

Brent D. Hierman, Lt. Col., Associate Professor of International Studies and Political Science. B.A. Lafayette College; Ph.D., Indiana University Bloomington. (2011; 2017)

Stephanie L. Hodde, Maj., Assistant Professor of English. B.A., William Smith College; M.A., University of Chicago; Ph.D., University of Illinois-Chicago. (2016; 2016)

Timothy M. Hodges, Col., Head of Physics and Astronomy, Professor of Mechanical Engineering. B.S., Virginia Military Institute; M.S., Montana State University; Ph.D., University of Virginia. Professional Engineer. (1980; 1995)

Ryan R. Holston, Col., Professor of International Studies and Political Science. B.A. Dickinson College; MSc., London School of Economics and Political Science; Ph.D., Johns Hopkins University. (2009; 2018)

Wakeel I. Idewu, Lt. Col., Assistant Professor of Civil Engineering. B.S., M.S., Ph.D., Louisiana State University. Professional Engineer. (2009; 2015)

Catharine Clarke Ingersoll, Dr., Assistant Professor of Art History. B.A., Washington College; M.A., Ph.D., University of Texas at Austin. (2015; 2015)

Michelle Iten, Maj., Assistant Professor of English. B.A., M.A., Cloud State University; Ph.D., Texas Christian University. (2015; 2015)

Matthew S. Jarman, Maj., Assistant Professor of Psychology. B.A., University of California, Los Angeles; M.B.A., Claremont Graduate University; Ph.D., Claremont Graduate University. (2015; 2015)

R. Geoffrey Jensen, Col., Professor of History. Holder of the John Biggs '30 Cincinnati Chair in Military History. B.A., Indiana University; M.A., Ph.D., Yale University. (2004; 2005)

Bing Jiang, Dr., Assistant Professor of Economics and Business. B.A., South-Central University for Nationalities-China; M.A., University of Mississippi; M.A., Ph.D., Emory University. (2013; 2013)

Jack B. (Jay) Johnson, Jr., Col., Professor of Physical Education and Director of VMI Summer Session. M.S., Radford University; Ph.D., Virginia Tech. (2006; 2016)

M. Houston Johnson V, Lt. Col., Associate Professor of History. B.A., Roanoke College; M.A., Ph.D., University of Tennessee, Knoxville (2012; 2018)

Tappey H. Jones, Col., Professor of Chemistry. B.S., Virginia Military Institute; Ph.D., University of North Carolina. (1993; 1997)

Chad A. Joyce, Capt., Instructor in Physical Education. B.S., Springfield College; M.A., Old Dominion University. (2002; 2002)

Jai K. Jung, Maj., Assistant Professor of Civil Engineering. B.S., Han Yang University; Ph.D., Cornell University. (2018; 2018)

Youna Jung, Dr., Assistant Professor of Computer and Information Sciences. B.S., M.S., Ph.D., Ajou University, South Korea. (2015; 2015)

Jeffry Kendrick, Maj., Assistant Professor of Modern Languages. B.S. University of Arkansas; M.A. University of Arkansas; Ph.D. University of Kansas. (2013; 2013)

Molly H. Kent, Maj., Assistant Professor of Biology. B.S., University of Wisconsin-Madison; Ph.D., University of Illinois Urbana-Champaign. (2019; 2019)

Keith A. Kline, Col., Professor of Psychology. B.S., Virginia Tech; M.S., Ph.D., University of Tennessee. (2005; 2017)

Steven E. Knepper, Maj., Assistant Professor of English. B.A., Juniata College; M.A., Ph.D., University of Virginia. (2014; 2014)

Kenneth E. Koons, Col., Professor of History and Holder of the General Edwin Cox '20 Institute Professorship in History and Economics. B.A., M.A., Shippensburg State College; D.A., Carnegie-Mellon University. (1982; 1992)

Michael S. Krackow, Col., Professor of Physical Education. B.S., Hofstra University; M.Ed., University of Cincinnati; Ph.D., Virginia Tech. (2012; 2016)

Sabrina S. Laroussi, Dr., Assistant Professor of Modern Languages and Cultures. B.A., Universite d'Alger, Algeria; M.A., Universidad de Alcalá, Spain; M.A., Ph.D., Texas Tech University. (2015; 2015)

Ramoni O. Lasisi, Dr., Assistant Professor of Computer and Information Sciences. B.S., Federal University of Agriculture, Abeokuta, Nigeria; M.S., University of Lagos, Nigeria; PhD., Utah State University. (2014; 2014)

Jessica M. Libertini, Lt. Col., Associate Professor of Mathematics. B.S., Johns Hopkins; Sc.M., Brown University; M.S., Rensselaer Polytechnic Institute; Ph.D., Brown University. (2014; 2018)

Emily L. Lilly, Lt. Col., Associate Professor of Biology. B.A, Smith College; Ph.D., Massachusetts Institute of Technology. (2010; 2014)

David L. Livingston, Col., Professor of Electrical and Computer Engineering. BSE, ME, Ph.D., Old Dominion University. Professional Engineer. (1999; 2001)

Lunpeng Ma, Dr., Assistant Professor of Modern Languages and Cultures. B.A., M.A., Shanghai Tong University, China; Ph.D., Stony Brook University. (2014; 2014)

Raymond J. Macdermott, Col., Professor of Economics and Business. B.A., Ithaca College; M.A., University of Pittsburgh; Ph.D. Rutgers University. (2006; 2016)

Mary Beth Manjerovic, Maj., Assistant Professor of Biology. B.S., University of Maine; M.S., West Virginia University; Ph.D., University of Central Florida. (2017; 2017)

Daniel F. McCain, Lt. Col., Associate Professor of Chemistry. B.S., Alleghany College; M.S., Ph.D., Albert Einstein College of Medicine. (2004; 2010)

Turk McCleskey, Col., U.S. Marine Corps Reserve (Ret.), Professor of History. B.A., University of Texas at Austin; Ph.D., College of William and Mary. (1994; 2001)

Thomas J. McCormick, Col., USA (Ret.), Visiting Assistant Professor of Electrical and Computer Engineering. B.S., U.S. Military Academy; M.S., George Mason University; M.S., Ph.D., George Washington University.

Christina R. McDonald, Col., Professor of English and Institute Director of Writing. B.A., Rollins College; Ph.D., Texas Christian University. (2002; 2004)

Robert L. McDonald, Col., Associate Dean for Academic Affairs and Professor of English. B.A., Winthrop College; M.A., East Tennessee State University; Ph.D., Texas Christian University. (1992; 2002)

Robert L. McMasters, Capt., Professor of Mechanical Engineering. B.S., United States Naval Academy; Ph.D., Michigan State University. Professional Engineer. (2004; 2007)

Emily P. Miller, Col., Professor of English and Head of Department of English, Rhetoric, and Humanistic Studies, and Holder of the Navas-Read Chair in English Literature. B.A., M.A., College of William and Mary; Ph.D., University of Virginia. (1988; 1993)

Deanne L. Moosman, Capt., Instructor in Physical Education. B.S., University of Rhode Island; M.S., Eastern Kentucky University. (2015; 2015)

Paul R. Moosman, Jr., Col., Professor of Biology. B.S. Virginia Military Institute; M.S. Eastern Kentucky University; Ph.D. Auburn University. (2008; 2019)

Dekuwmini Mornah, Dr., Assistant Professor of Economics and Business. B.S., University of Ghana; M.A., Ph.D., University of Mississippi. (2008; 2012)

Tim Murray, Maj., Assistant Professor of Economics and Business. B.A., M.B.A., Old Dominion University; Ph.D., University of Connecticut. (2019; 2019)

W. Wayne Neel, Col., Professor of Mechanical Engineering. B.A., M.A., University of South Florida; M.M.E., Ph.D., North Carolina State University. Professional Engineer. (1989; 1996)

Charles D. Newhouse, Col., Professor of Civil Engineering and Holder of the Charles S. Luck, Jr. '20 Institute Professor in Engineering. B.S., M.S., Ph.D., Virginia Tech. Professional Engineer. (2008; 2014)

Eric W. Osborne, Lt. Col., Associate Professor of History. B.A., North Carolina State University; M.A., University of South Carolina; Ph.D., Texas Christian University. (2007; 2013)

Timothy J.A. Passmore, Assistant Professor of International Studies and Political Science. B.A., Lee University; M.Litt., University of St. Andrews; M.A., Ph.D., University of Colorado. (2019; 2019)

Blain A. Patterson, Maj., Post-Doctoral Professor of Applied Mathematics. B.S., Youngstown State University; M.S., Ph.D. North Carolina State University. (2019; 2019)

Sarah E. Patterson, Maj., Assistant Professor of Applied Mathematics. B.S., Youngstown State University; Ph.D., Duke University. (2019; 2019)

Andrei Ramniceanu, Maj., Assistant Professor of Civil Engineering. B.S., M.S., Ph.D., Virginia Tech. Professional Engineer. (2016; 2016)

J. Patrick Rhamey, Lt. Col., Associate Professor of International Studies. B.A., Rhodes College; M.A., University of Georgia; Ph.D., University of Arizona. (2012; 2018)

Holly Jo Richardson, Col., Professor of Physical Education. B.S., University of Iowa; M.S., University of Wisconsin-LaCrosse; Ph.D., Ohio State University. (1997; 2001)

Duncan J. Richter, Professor of Philosophy. B.A., Oxford University; M. Phil., University College of Swansea; Ph.D., University of Virginia. (1995; 1996)

John E. "Ned" Riester, Jr., Capt., Professor and Head of Civil & Environmental Engineering and Director of Virginia Military Institute Summer Transition Program. B.S., Virginia Military Institute; M.S., Ph.D., Old Dominion University. Professional Engineer. (1993; 2001)

Gary K. Rogers, Col., Professor of Civil Engineering. B.S., West Virginia Institute of Technology; M.E., University of California, Berkeley; Ph.D., Virginia Tech. Professional Engineer. (1993; 2001)

Richard A. Rowe, Col., Professor of Biology and Holder of the Bruce C. Gottwald Sr, '54 Chair for Academic Excellence. B.A., Ripon College; M.S., Bowling Green State University; Ph.D., Michigan State University. (1991; 1997)

Chhanda Samanta, Col., Professor of Physics. B.S., M.S., University of Calcutta; Ph.D., University of Maryland. (2013; 2018)

Howard B. Sanborn, IV, Col., Professor of International Studies and Political Science. B.A., Washington and Lee University; M.A., Ph.D., University of Iowa. (2008; 2018)

Lizeth Elizondo Schroepfer, Maj., Assistant Professor of History. B.A., B.S., California State University, Chico; M.A., California State University, San Diego; Ph.D., University of Texas, Austin. (2019; 2019)

Jason W. Schroepfer, Maj., Assistant Professor of Modern Languages and Cultures. B.A, University of California; M.A., Ph.D., University of Texas. (2018; 2018)

Tinni Sen, Col., Professor of Economics and Business. B.S., M.S., Calcutta University; Ph.D., University of Mississippi. (2001; 2011)

Troy J. Siemers, Col., Professor and Head of Applied Mathematics. B.S., M.S., Purdue University; Ph.D., University of Virginia. (1999; 2009)

Kathryn Simms, Maj., Assistant Professor of Economics & Business. B.S., M.T.A., University of Alabama; C.P.A., Georgia; Ph.D., University of Georgia; Ph.D., Old Dominion University. (2017; 2017)

D. Todd Smith, Col., Professor of Electrical and Computer Engineering. B.S., Virginia Military Institute; M.S., Duke University; Ph.D., University of Virginia. Professional Engineer. (1996; 2004)

Jeffrey G. Smith, Jr. Brig. Gen., USA (Ret.), Professor of Computer and Information Sciences. B.A., Virginia Military Institute; M.S., National War College; Ph.D., Princeton University. (2014; 2018)

Jeffrey S. Smith, Lt. Col. USAF (Ret.), Associate Professor of Economics and Business. B.A., University of South Carolina; M.S., Wright State University; Ph.D., University of Tennessee. (2011; 2011)

Stanton Q. Smith, Col., Professor and Head of Chemistry. B.S., University of Central Florida; Ph.D., University of Virginia. (1999; 2014)

Ashleigh B. Smythe, Lt. Col., Associate Professor of Biology. B.S., University of Vermont; M.S., Southern Louisiana University; Ph.D., University of California. (2014; 2019)

James C. Squire, Col., Professor of Electrical and Computer Engineering. B.S., United States Military Academy; M.S., Ph.D., Massachusetts Institute of Technology. Professional Engineer. (2000; 2008)

Jillian L. Stuart, Maj., Assistant Professor of Psychology. B.S., University of Mary Washington; Ph.D., University of Iowa. (2018; 2018)

Gerald A. "Jay" Sullivan, Col., Professor of Mechanical Engineering. B.S., University of Vermont; M.S., Ph.D., Rensselaer Polytechnic University. Professional Engineer (2004; 2014)

Glenn R. Sullivan, Lt. Col., Associate Professor of Psychology. B.A., Dominican College of San Rafael; M.S., Ph.D., Pacific Graduate School of Psychology. (2006; 2013)

Donald R. Sunnen, Col., Professor and Head of Modern Languages and Cultures. B.A., Lawrence University; M.A., Ph.D., University of Illinois. (1990; 2001)

Matthew K. Swenty, Lt. Col., Associate Professor of Civil & Environmental Engineering. B.S., M.S., University of Missouri-Rolla; Ph.D., Virginia Tech. Professional Engineer. (2011; 2017)

Mohamed Taifi, Professor of Modern Languages and Cultures. Diploma of Advanced Studies, University of Mohammed V; Third Cycle Doctorate, University of Strasbourg; State Doctorate of Letters, University of Aix-Marseille. (2003; 2003)

John R. Thompson, Col., Professor of Physics and Astronomy and Holder of the Cameron Professorship in Physics and Astronomy, B.S., Tennessee Technology University; M.S., Georgia Institute of Technology; Ph.D., Georgia Institute of Technology. (2006; 2006)

Pennie J. Ticen, Lt. Col., Associate Professor of English. B.A., Mount Holyoke College; M.A., Ph.D., University of Massachusetts, Amherst. (2003; 2006)

Thomas C. Timmes, Col., USA (Ret.), Associate Professor of Civil & Environmental Engineering. B.S., Virginia Military Institute; M.S., Johns Hopkins University; Ph.D., Pennsylvania State University. Professional Engineer. (2017; 2017)

Daniela M. Topasna, Col., Professor of Physics. B.S., University of Bucharest; M.S., Ph.D., Virginia Tech. (2002; 2016)

Gregory A. Topasna, Col., Professor of Physics. B.S., M.S., Ph.D., Virginia Tech. (2000; 2015)

Blair P. Turner, Capt., Professor of History and Political Science. B.A., St. Andrews Presbyterian College; M.A., Ph.D., University of Florida. (1982; 1991)

Stacey K. Vargas, Col., Professor of Physics. B.S., Wheeling Jesuit College; M.S., Ph.D., University of Connecticut. (1996; 2008)

Douglas B. Wainwright, Maj., Computer and Information Sciences IT Manager and Instructor. B.A., Virginia Military Institute; M.D.E., University of Maryland University College.

Clifford T. West, Jr., Col., Professor and Head of Economics and Business. B.A., University of California, San Diego; M.B.A., University of Notre Dame; Ph.D., Indiana University. (1996; 2001)

Sara S. Whipple, Maj., Assistant Professor of Psychology. B.A., Wake Forest University; M.A., University of Richmond; Ph.D., Cornell University. (2014; 2014)

James H. Whitten, Capt., Instructor of Physical Education. B.S., M.A.Ed., Virginia Tech. (2016; 2016)

Mark F. Wilkinson, Professor and Head of History. B.A., Georgetown University; M.A., University of Maryland; Ph.D., University of Michigan. (1993; 1998)

Henry A. Wise, Maj., Assistant Professor of English. B.A., Virginia Military Institute; M.F.A., University of Mississippi. (2017; 2017)

Fang Xie, Assistant Professor of Modern Languages and Cultures. M.A., Beijing University; Ph.D., Stanford University. (2016; 2016)

Qingfei Yin, Assistant Professor of History. B.A., Beijing University; M.S., Beijing University and London School of Economics; Ph.D., George Washington University. (2018; 2018)

Hongbo Zhang, Dr., Assistant Professor of Computer and Information Sciences. B.S., Jilin University, China; M.S., Ph.D., Virginia Tech. (2017; 2017)

Adjunct Faculty 2019-2020

George A. Abry, Jr., English, Rhetoric, and Humanistic Studies. B.A., University of New Orleans; M.A.,Johns Hopkins University; M.H.P., Tulane University.

Nicholas C. Auclair, International Studies and Political Science. B.A., Ohio State University; M.A., University of the Philippines.

E. Douglass Ayer, Jr., International Studies & Political Science. B.A., Bates College; M.A., Harvard University; M.A., Tufts University.

William D. Badgett, Col., English, Rhetoric, and Humanistic Studies. B.A., Virginia Military Institute; M.A., Harvard University.

Herbert F. (Herb) Barber, Psychology. Ph.D., Southern Illinois University.

Jeffery C. Batis, Psychology. M.A., PhD., Wayne State University.

Tracy A. Bell, Biology. B.S., University of Nebraska; D.V.M., University of Florida.

Scott E. Belliveau, International Studies & Political Science. B.A., Virginia Military Institute; M.A., American University.

Amiel R. V. Bernal, English, Rhetoric, and Humanistic Studies. B.A., Colorado State University; M.A., Ph.D., Virginia Tech.

Mark H. Bryant, Biology. B.S., Virginia Military Institute; M.S., Michigan State University.

Douglas M. Caldwell, Civil & Environmental Engineering. B.S., M.S., Virginia Tech.

Mariko A. Clarke, History. B.A., Aoyama Gakuin University; M.A., Fort Hays State University.

Jenny Crance, Physical Education. B.S., James Madison University; M.S., University of Virginia.

Toinette Culp, Biology. B.S., University of Maryland; M.P.T., Old Dominion University.

Paul Damerell, Mechanical Engineering. B.S., M.S., Purdue University.

Annick H. Dupal, English, Rhetoric, and Humanistic Studies. B.A., American University; M.A., Brigham Young University; M.S., James Madison University.

Joshua O. Elrod, International Studies and Political Science. B.A., College of Wooster; J.D., University of Virginia.

Daniel K. Evans, Economics and Business. B.S., Tennessee Wesleyan University; J.D., Washington and Lee University.

Ivelise Faundez-Reitsma, Modern Languages and Cultures. B.A., SUNY College at Old Westbury; M.A., Purdue University; Ph.D., Washington University in St. Louis.

Janice E. Friend, Biology and Chemistry. B.S., Kenyon College; M.S., Ph.D., Yale University.

Joseph R. Gearhart, Economics and Business. B.A., Emory and Henry College; M.S., James Madison University.

Heena T. Ghandi, Applied Mathematics. B.S., M.S., Ph.D., University of Baroda.

Heather Ghosheh, Biology. B.S., Instituto María Auxiliadera; B.S.Med., Escuela Autonoma de Ciencias Médicas de Centro América; M.P.H., East Carolina University.

Philip A. Gibbs, Economics & Business. B.S., University of Texas-Austin; M.B.A., University of Chicago; Ph.D., Massachusetts Institute of Technology.

James R. Greiner, Physical Education. B.S., M.S., Miami University.

Eileen T. Hinks, Biology and Chemistry. B.S., Ursinus College, Ph.D., Temple University School of Medicine.

Victoria F. Hodges, Economics & Business. B.S., M.B.A., James Madison University.

Kristin Hoff, Maj., Psycology and Physical Education. B.S., M.S., Psy.D., Xavier University.

Jennifer W. Hough, Applied Mathematics. B.S., Pennsylvania State University; M.S., Oregon State University.

P. Douglas Humphries, Col. (USA Ret), International Studies and Political Science. B.A., M.A., University of California, Los Angeles; M.S., National Defense University; D.L.S., Georgetown University.

Eric J. Hunter, Psychology. B.A., Virginia Military Institute.

Robert B. James, Col., USA (Ret.), International Studies and Political Science and Holder of the Mary Moody Northen Chair in Economics. B.A., Ohio Northern University; M.Ed., Bowling Green University.

Sarah L. Jones, Lt. Col., Psychology. M.Ed., Virginia Commonwealth University; Psy.D., James Madison University.

E. Susan Kellogg, Economics and Business. B.A., University of Cincinnati; M.A., Syracuse University; M.B.A., Loyola University, Maryland; Ph.D., Union Institute & University, Cincinnati.

Dean A. Kershaw, Col., USA (Ret.), Civil Engineering. B.S., Virginia Military Institute; M.S., George Washington University.

Minsoo Kim, Dr., Computer and information Sciences. B.S., M.S., Ph.D, Ajou University, South Korea.

William D. Kimsey, English, Rhetoric, and Humanistic Studies. B.S. East Tennessee State University; M.A., Arizona State University; Ph.D., Southern Illinois University.

Clifford A. Kiracofe, Jr., History. B.A., M.A., Ph.D., University of Virginia.

Henry Y. Kirby, English, Rhetoric, and Humanistic Studies. B.A., M.A., Virginia Tech.

John W. Knowles, III, Modern Languages & Cultures. B.A., M.A., Ph.D., Virginia Tech.

Durig Lewis, Physics. Ph.D., University of London.

Billy H. Kornegay, Civil & Environmental Engineering. B.S., Virginia Military Institute; M.S., Ph.D., Clemson University.

Tim Knudson, Physics. Ph.D., University of Utah.

William B. Lowe, Jr., Col., USAF (Ret.), Applied Mathematics. B.S., U.S. Air Force Academy; M.S., North Carolina State University.

Bruce N. MacDonald, Economics and Business. B.A., Trinity College.

Thomas J. McCormick, Col., USA (Ret.), Physics. B.S., U.S. Military Academy; M.S., George Mason University; M.S., Ph.D, George Washington University.

Meghan Melinchak, Physical Education. B.S., Kent State University; M.Ed., University of Virginia.

Kelly Minor, History. B.A., M.A., University of West Florida: Ph.D., University of Florida.

Lucy Damaris Cartagena Morris, Modern Languages and Cultures. B.A., Brigham Young University; M.A., University of Utah; Ph.D., ABD, University of California-Itvine.

W. Grigg Mullen, Jr., Civil & Environmental Engineering. B.S., Virginia Military Institute; M.S., University of Virginia; Ph.D., Virginia Tech.

Stephen L. Neas, Maj., USA (Ret.), Civil Engineering. B.S., Virginia Military Institute.

Thomas R. Panko, Lt. Col., Computer and information Sciences. B.S., MBA, University of Southern Mississippi

Philippe Pansiot, Modern Languages and Cultures. M.A., Sorbonne Nouvelle.

B.J. Parson, Lt. Col., USA (Ret.), Biology. B.S., Western Kentucky University; M.D., University of Louisville.

Ana Cristina Pinto-Bailey, Modern Languages and Cultures. Ph.D., Tulane University.

Louis R. F. Preysz, III, Economics & Business. B.A., University of Wisconsin, Madison; M.B.A., University of Utah, Salt Lake City; Rutgers University, graduate of Stonier Graduate School of Banking.

Dale R. Raymond, Chemistry. B.S., M.S., Ph.D., University of Maine.

Zebulen A. Riley, Economics and Business. B.S., George Mason University; M.A., Virginia Polytechnic Institute and State University.

Samuel K. Roskelley, Civil Engineering. B.S., Brigham Young University; M.S., University of Virginia.

Woodson A. Sadler, Jr., Col., USMC (Ret.), Civil Engineering. B.S., Virginia Military Institute; M.S., University of Southern California.

Samuel E. Saunders, III, Civil & Environmental Engineering. B.S., Virginia Military Institute; M.E., University of Virginia.

Klaus Schmider, History. M.A., Ph.D., Johannes-Gutenberg-Universitat Mainz.

Micah W. Schultz, English, Rhetoric, and Humanistic Studies. B.A. Bridgewater College; M.A., James Madison University.

W. Greg Shear, Jr., Rear Adm., USN (Ret.), Wachtmeister Chair in Science and Engineering, Civil & Environmental Engineering. B.S., U.S. Naval Academy; M.S., University of Colorado; M.A., Naval War College.

Mohammed Shihab, Modern Languages and Cultures. M.A., University of Virginia.

Mayling Simpson, Biology. Ph.D., University of North Carolina at Chapel Hill.

Claudia M. Smigrod, Holder of the Edwin P. Conquest Chair in the Humanities, English, Rhetoric, and Humanistic Studies. B.F.A., College of Ceramics of the State of New York; M.F.A, George Washington University.

Douglas N. Smith, English, Rhetoric, and Humanistic Studies. B.S, University of Richmond; M.A., Regent University.

Mattie Q. Smith, English, Rhetoric, and Humanistic Studies. B.A., M.A., Hollins University.

Roscoe B. Stephenson, III, Economics & Business. B.A., University of North Carolina at Chapel Hill; J.D., Washington & Lee University.

Bruce J. Summers, Economics & Business. B.A., University of Notre Dame; M.A., University of Illinois.

Linyue Tong, Chemistry. Ph.D., Binghamton University.

Adam C. Volant, Psychology. B.A., Virginia Military Institute; M.S. Capella University; M.S., Army War College.

John R. Vosburgh, Applied Mathematics. M.S., Syracuse University.

Jingxiong Wang, Lopez Visiting Chair in Asian Studies. M.A., Nanjing Normal University.

Emeritus Faculty

Arthur A. Adams, III, Lt. Col., Emeritus Lecturer in Physics. B.A., Emory University; M.S., University of Alabama. (1967; 1993)

William D. Badgett, Col., Emeritus Professor of English and Fine Arts. B.A., Virginia Military Institute; M.A., Harvard University. (1955; 2009)

Gordon V. Ball, Jr., Col., Emeritus Professor of English and Fine Arts. A.B., Davidson College; M.A., Ph.D., University of North Carolina. (1989; 1993)

S. Alan Baragona, Col., Emeritus Professor of English. B.A., Davidson College; M.A., Ph.D., University of North Carolina. (1986; 2013)

Daniel W. Barr, Col., USA (Ret.), Emeritus Professor of Electrical and Computer Engineering. B.S., Virginia Military Institute; M.S., Ph.D., University of Virginia. Professional Engineer. (1982; 2017)

John G. Barrett, Col., Emeritus Professor of History. B.A., Wake Forest University; M.A., Ph.D., University of North Carolina. (1953; 1987)

R. Meredith Zehner Bedell, Col., Emeritus Professor of English. B.A., Wake Forest University; M.A., Ph.D., Florida State University. (1976; 2008)

David W. Bolen, Jr., Col., Professor Emeritus of Mathematics. B.S., Davidson College; M.A., Duke University; Ph.D., North Carolina State University. (1969; 2005)

Charles F. Brower, IV , Brig. Gen., USA (Ret.), Emeritus Professor of International Studies. B.S., United States Military Academy; M.A., University of Pennsylvania; M.A., U.S. Naval War College; Ph.D., University of Pennsylvania. (2001; 2016)

C. Dale Buckner, Col., Emeritus Professor of Civil Engineering. B.S., M.S., Ph.D., North Carolina State University; Professional Engineer. (1985; 2008)

Josiah Bunting, III, Maj. Gen., Superintendent Emeritus and Professor of Humanities. B.A., Virginia Military Institute; B.A. and M.A., Oxford University; D.Litt. (Hon.) Hampden-Sydney College; D. Litt. (Hon.), Washington College; L.H.D. (Hon.), Catawba College. (1995; 1995)

H. Francis Bush, Col., Emeritus Professor of Economics and Business. B.A., SUNY at Buffalo; M.Acc., Ohio State University; Ph.D., University of Florida. (1994; 1997)

Gordon O. Calkins, Col., Emeritus Professor of Physical Education. B.A., M.Ed., Springfield College; Ed.D., Virginia Tech. (1971; 2005)

P. Allan Carlsson, Col., Emeritus Professor of Philosophy. B.A., Wheaton College; B.D., Trinity Evangelical Divinity School; M.A., Wheaton College; Ph.D., Northwestern University. (1961; 1991)

D. Rae Carpenter, Jr., Col., Emeritus Professor of Physics and Director of Research for VMI Research Laboratories. B.S., Roanoke College; M.S., Cornell University; Ph.D., University of Virginia. (1951; 1992)

Edward L. Claiborn, Col., Emeritus Professor of Economics and Business. B.S., University of Idaho; M.A., Ph.D., Princeton University. (1981; 1998)

James B. Davis, Col., Emeritus Professor of English; B.S., Spring Hill College; M.A., Tulane University; Ph.D., University of Virginia. (1964; 1992)

Thomas W. Davis, Col., Emeritus Professor of History. B.A., Virginia Military Institute; M.A., Ph.D., University of North Carolina. (1972; 2007)

Lee S. Dewald, Sr., Col., Emeritus Professor of Applied Mathematics. B.S., The Citadel; M.B.A., Long Island University; M.S., Ph.D., Naval Postgraduate School. (2002; 2017)

Floyd H. Duncan, Col., Emeritus Professor of Economics and Business. B.S., Virginia Military Institute; M.B.A., Ph.D., University of South Carolina. (1978; 2013)

David L. Dupuy, Col., Emeritus Professor of Physics and Astronomy. A. B., King College; M.A., Wesleyan University; Ph.D., University of Toronto. (1982; 2006)

Alan F. Farrell, Brig. Gen., Emeritus Professor of Modern Languages and Cultures. B.A. Trinity College; M.A. - French, M.A. - German, Ph.D., Tufts University. (1995; 2014)

Charles E. Fraley, Col., Professor Emeritus of Economics and Business. B.S., East Central State University; B.S., Southwestern Oklahoma State University; M.A., Ph.D., University of Oklahoma. (1980; 2006)

Edwin J. Goller, Col., Emeritus Professor of Chemistry. B.S., Merrimack College; M.S., Northeastern University; Ph.D., University of New Hampshire. (1969; 1999)

Myron H. Gluck, Col., Emeritus Professor of Computer and Information Sciences. B.S., University of Michigan; M.A., University of Oklahoma; Ph.D., Syracuse University. (2001; 2005)

Louis R. Hundley, Col., Emeritus Professor of Biology. B.S., Virginia Military Institute; M.S., Ph.D., Virginia Tech (1950; 1989)

Donald K. Jamison, Col., Emeritus Professor of Civil Engineering, Assistant to the Athletic Director. B.S., Virginia Military Institute; M.S., University of California; Ph.D., University of Wisconsin. Professional Engineer. (1957; 1992)

Robert A. Johnson, Col., Emeritus Professor of Electrical and Computer Engineering. B.S.E.E., M.S., and Ph.D., Clemson University. Professional Engineer. (1984; 2004)

Arnold W. Joyce, Emeritus Professor of Physical Education. B.S., M.S., Springfield College; Dir. P.E., Indiana University; Ed.D., Virginia Tech. (1966; 1983)

A. Cash Koeniger, Col., Emeritus Professor of History. B.A., Washington and Lee University; M.A., Ph.D., Vanderbilt University. (1986; 2013)

John G. Leland, Col., Emeritus Professor of English. B.A., M.A., Ph.D., University of North Carolina. (1986; 2013)

Thomas C. Lominac, Col., Emeritus Professor of Mathematics and Computer Science. A.B., M.S., Ph.D., University of North Carolina. (1982; 1987)

Robert E. Ludt, Col., Emeritus Professor of Chemistry. A.B., Thiel College; M.A., Ph.D., Duke University. (1970; 2009)

Patrick M. Mayerchak, Col., Emeritus Professor of Political Science and International Studies. B.A., M.A., University of Kentucky; Ph.D., American University, School of International Service. (1976)

Thomas N. Meriwether, Col., Emeritus Professor of Psychology. B.A., Vanderbilt University; M.S., Ph.D., University of Tennessee. (1995; 1996)

Charles D. Morgan, Col., Professor Emeritus of Mechanical Engineering. B.S., Stevens Institute of Technology; M.S., Rensselaer Polytechnic Institute; Ph.D., Lehigh University. Professional Engineer. (1986; 2001)

James M. Morgan, Jr., Maj. Gen., Dean Emeritus of the Faculty and Professor of Civil Engineering. B.S., Virginia Military Institute; M.S., D.Eng., Johns Hopkins University. Professional Engineer. (1946; 1984)

W. Grigg Mullen, Jr., Col., Professor Emeritus of Civil & Environmental Engineering. B.S., Virginia Military Institute; M.E., University of Virginia; Ph.D., Virginia Tech. Professional Engineer. (1992; 2017)

John H. Page, Col., Emeritus Professor of Civil Engineering. B.S., Davis and Elkins College; M.S., Ph.D., University of Virginia. Professional Engineer. (1979; 2010)

Daniel Y. Pharr, Col., Professor Emeritus of Chemistry. B.A., University of North Carolina; M.A., Wake Forest University; Ph.D., University of Massachusetts. (1982; 2019)

George Piegari, Col., Professor Emeritus of Mathematics and Computer Science. B.S., Montclair State College; M.A., Pennsylvania State University; Ph.D., Vanderbilt University. (1965; 2007)

Steven Riethmiller, Col., Emeritus Professor of Chemistry. B.S., Virginia Military Institute; Ph.D., University of South Carolina. (1963; 2008)

R. Wane Schneiter, Brig. Gen., Dean Emeritus and Professor of Civil and Environmental Engineering. B.S., Ph.D., Utah State University. Professional Engineer. (1990; 2014)

Henry D. Schreiber, Col., Emeritus Professor of Chemistry. B.S., Lebanon Valley College; Ph.D., University of Wisconsin-Madison. (1976; 2014)

Frank A. Settle, Jr., Col., Emeritus Professor of Chemistry. B.S., Emory and Henry College; Ph.D., University of Tennessee. (1964; 1992)

Michael R. Sexton, Capt., USNR (Ret.), Emeritus Professor of Mechanical Engineering. B.S., M.S., Ph.D., Virginia Tech. Professional Engineer. (1985; 2008)

Rose Mary Sheldon, Col., Emeritus Professor of History. B.A., Trenton State College; M.A., Hunter College; Ph.D., University of Michigan. (1993; 2019)

H. Richard Skutt, Col., Emeritus Professor of Electrical and Computer Engineering. B.S., M.S., Virginia Tech; Ph.D., Worcester Polytechnic Institute. Professional Engineer. (1978; 1996)

Donald E. Thomas, Col., Emeritus Professor of History. B.A., University of Michigan; M.A., Ph.D., University of Chicago. (1972; 2001)

Richard S. Trandel, Col., Emeritus Professor of Mechanical Engineering. B.S., Virginia Military Institute; M.S., Virginia Tech; Ph.D., University of Virginia. Professional Engineer. (1959; 2004)

James E. Turner, Col., Emeritus Professor of Biology. B.A., Virginia Military Institute; M.S., University of Richmond; Ph.D., University of Tennessee. (1967; 2019)

Bruce C. Vandervort, Col., Emeritus Professor of History. B.A., University of Wisconsin; M.A., University of Cincinnati; Ph.D., University of Virginia. (1989; 2016)

Vonda K. Walsh, Col., Emeritus Professor of Applied Mathematics. B.S., Clinch Valley College; M.S., Virginia Tech; Ph.D., Medical College of Virginia. (1985; 1998)

Henry G. Williams, Jr., Emeritus Profesor of Mathematics. B.S., Wake Forest University; M.A., Ph.D., Duke University. (1964; 2001)

The Athletic Staff 2019-2020

David L. Diles, Dr., Director, Department of Intercollegiate Athletics. B.S., M.S., Ohio University; Ed.D., University of Michigan.

Timothy M. Hodges, Col., Faculty Athletic/Facilities Director and Head of Physics and Astronomy, Professor of Mechanical Engineering. B.S., Virginia Military Institute; M.S., Montana State University; Ph.D., University of Virginia. Professional Engineer. (1980; 1995)

Jamie M. Beasley, Assistant Athletic Director of Academic Services & Compliance. B.A., Valdosta State University.

Sean D. Bernstein, Assistant Men's and Women's Track and Field Coach. B.S., SUNY-Oneonta.

Jonathan M. Birsner, Head Men's Lacrosse Coach. B.S., U.S. Military Academy.

William F. Bither, Sr., Lt. Col., Rifle Coach. B.S., North Georgia College; M.S., James Madison University.

Wade H. Branner, Associate Athletic Director for Athletic Communications. B.A., Virginia Military Institute.

Andrew Bretscher, Director of Men's and Women's Swimming and Diving. B.S., Ohio State University; M.S., Frostburg State University.

Harold L. Brown, Jr., Assistant Athletic Director for Facilities and Compliance. B.S., M.S., Virginia Tech.

Mike Carpentar, Assistant Sports Information Director. B.S., Slippery Rock University.

Kevin J. Carroll, Assistant Basketball Coach. B.S., Berry College; M.A., University of Alabama-Tuscaloosa.

Thomas A. Clark, Assistant Head Football Coach/Defensive Coordinator. B.A., University of Maryland.

Kelsey Croak, Assistant Athletic Trainer. B.S., University of Toledo; M.Ed., University of Virginia.

Sean Doyle, Assistant Lacrosse Coach. B.S., Robert Morris University.

Daniel Earl, Head Basketball Coach. B.S., M.B.A., Pennsylvania State University.

Ryan Eddy, Assistant Athletic Trainer. B.S., Pennsylvania State University; M.S., University of Virginia.

Steve Enright, Assistant Basketball Coach. B.S., Mount Ida College.

Zach Fischer, Coordinator of Athletic Media. B.A., Temple University.

David C. Forman, Director of Strength and Conditioning/Head Football Strength Coach. B.S., James Madison University; M.S., University of Mississippi.

Lance M. Fujiwara, Associate Athletic Director, Sports Medicine & Athletic Training. B.S., Oregon State University; M.Ed., University of Virginia.

James Gibson, Head Wrestling Coach. B.S., Edinboro University; M.Ed., Clarion University.

Jonathan E. Hadra, Head Baseball Coach. B.A., Virginia Military Institute.

Sarah Hall, Assistant Athletic Trainer. B.S., Quinnipiac University; M.S., University of Virginia.

Chris Haught-Thompson, Head Women's Soccer Coach. B.A., Lake Forest College; M.S., California University of Pennsylvania.

Michael Hemphill, Director of Athletic Equipment Services. B.S., University of North Greenville.

Tyler Howard, Assistant Director of Athletic Equipment & Services. B.S., Ohio University.

Eric D. Hutchings, Col., Special Assistant to the Athletic Director/Military Affairs, Department of Intercollegiate Athletics. B.A., Virginia Military Institute; M.A., Command and Staff College; M.A., School of Advanced Military Science.

Donald K. Jamison, Col., Emeritus Professor of Civil Engineering and Assistant to the Athletic Director. B.S., Virginia Military Institute; M.S., University of California; Ph.D., University of Wisconsin; Professional Engineer. (1957; 1992)

Karen E. Johnson, Assistant Athletic Director for Finance and Administration. B.B.A., Saint Leo University; A.S., Southern Virginia University.

Kyle Jolly, Assistant Football Coach.

Austin Kenon, Assistant Basketball Coach. B.A., Virginia Military Institute.

Pat Kuntz, Assistant Football Coach.

David Lawson, Director of Sports Performance for Olympic Sports. B.A., West Virginia Tech; M.S., West Virginia University.

Andrew Ludtke, Dr., Assistant Track Coach. B.S., Lake Superior State; M.S., North Texas; Ed.D., Olivet Nazarene University.

Geoff Murphy, Assistant Baseball Coach. B.S., Boston College; M.S., Liberty University.

Daniella E. Pappas, Assistant Women's Soccer Coach. B.S., South Dakota State University; M.A., University of Central Missouri.

Ryan K. Pryor, Head Woman's Water Polo Coach. B.A., University of Michigan; J.D., University of Michigan Law School.

Marshall Roberts, Assistant Football Coach.

Sam Roberts, Assistant Baseball Coach. B.S., Virginia Military Institute.

Michael L. Saint Germain, Assistant Football Coach. B.A., Lafayette College.

Ty Schoffstall, Assistant Wrestling Coach. B.A., Edinboro University.

David Zachary Scott, Assistant Men's and Women's Track and Field Coach. B.A., Virginia Military Institute.

Jeff Sejour, Assistant Football Coach. B.S., Lafayette College.

Jamie Lynn Severns, Associate Athletic Director for External Relations and Senior Women's Administrator. B.A.A., Central Michigan University; M.B.A., The Citadel.

Bridget Shanks, Director of Tickets and Marketing. B.A., University of New Hampshire; M.S., James Madison University.

Brian Sheppard, Assistant Football Coach. B.S., Baker University.

Scott Wachenheim, Head Football Coach. B.S., U.S. Air Force Academy; M.Ed., University of Arkansas.

Darrin A. Webb, Director of Men's and Women's Track and Field, Cross Country. B.S., Syracuse University.

Daniel Whitehead, Associate Sports Information Director. B.A., Brigham Young University; M.S., West Virginia University.

Assigned Officers and Noncommissioned Officers of the United States Army, Navy, Marine Corps, and Air Force 2019-2020

Philip J. Cooper, Col., USAF, Professor of Aerospace Studies. B.S., Embry-Riddle Aeronautical University; M.A., Liberty University; M.A., Air Command and Staff College; M.A., U.S. Air War College.

Craig H. Streeter, Col. USMC, Professor of Naval Science & Department Head. B.S., Virginia Military Institute; M.A., Marine Corps Command and Staff College.

Michael E. Wawrzyniak, Col., USA, Professor of Military Science. B.A., University of Wisconsin-Madison; M.B.A., Syracuse University; M.A., Naval War College.

Robert Ballard, Master Sgt., USA, Instructor of Military Science and Leadership.

Lee F. Becker, Lieutenant, USN, Assistant Professor of Naval Science. M.S., Florida State University.

Collin A. Bissell, Maj., USA, Assistant Professor of Military Science and Leadership. B.A., Virginia Tech.

Ryan Braman, Lt. Col., USAF, Assistant Professor of Aerospace Studies. B.S., U.S. Air Force Academy; M.B.A., University of Maryland; M.S., University of Hawaii.

John J. Brown, Contractor, Assistant Professor of Military Science and Leadership. B.S., Arkansas Tech University; M.A., US Army Command & General Staff College.

Donald B. Bryan, Sgt. 1st Class, USAR, Instructor of Military Science. B.A., College of William & Mary.

David J. Cartwright, 1st Sgt., USA, Military Science Instructor.

Rosana J. Clancy, Sgt. 1st Class, USA, Human Resources Assistant. B.S., Wayland Baptist University.

Lakia M. Davis, Master Sgt., USAF, NCOIC AFROTC Det 880.

Christopher B. Fontana, Lieutenant, USN, Assistant Professor of Naval Science. B.S., Northern Illinois University.

Terrance D. Foote, CMDCS, USN, Command Senior Chief.

Clifford A. Franklin, Lt. Col., USAF, Director of Operations. B.S., M.C.D., Auburn University; Ph.D., University of Tennessee.

William K. Herring, Sgt. 1st Class, USA, Military Science Instructor.

Kristoff J. Kalau, Capt., USAF, Assistant Professor of Aerospace Studies. B.S., U. S. Air Force Academy.

Michael L. Kellner, Lieutenant, USN, Assistant Professor of Naval Science. B.S., SUNY Maritime Academy.

Peter J. Lindhome, Lieutenant, USN, Assistant Professor of Naval Science. B.S., U.S. Naval Academy.

Benjamin B. Marshall, Master Sgt., USA, Military Science Instructor.

Joshua E. Mccord, Master Sgt., USMC, Assistant Marine Officer Instructor.

Brian K. Motter, Master Sgt. (Ret.), USA, Military Science Instructor.

Jason F. Murphy, Capt., USMC, Junior Marine Officer Instructor. B.A., The Citadel.

Andres Prados, Staff Sergeant, USAF, NCOIC, Personnel.

Nathan R. Recta, Capt., USA, Assistant Professor of Military Science. B.A., University of Alaska—Fairbanks.

Clifton D. Sanders, Master Sgt., USA, Military Science Instructor.

Emily D. Shrum, Lieutenant, USN, Assistant Professor of Naval Science. B.S., Norwich University.

Shannon "Shane" Smith, Staff Sergeant, USAF, NCOIC, Administration Management.

Shane C. Sport, Sgt. Maj., USA, Senior Military Science Instructor.

Matthew I. Starr, Capt., USMC, Marine Officer Instructor. B.S., University of Minnesota.

Joseph J. Thompson III, Lt. Col. (Ret.), USAF, Instructor of Aerospace Studies. B.A., Virginia Military Institute; M.S., Troy State University; M.P.A., M.Ed., James Madison University.

Daniel W. Turbeville, Cmdr., USN, Executive Officer. B.S., U.S. Naval Academy.

Support Agencies

The VMI Alumni Agencies

The VMI Alumni Agencies ("Agencies") are comprised of four organizations that share the common purpose of raising funds, investing funds, and performing other activities on behalf of VMI alumni and other donors in support of Virginia Military Institute (VMI). Significant sources of revenue consist of contributions and investment return. Due to their shared purpose, the Agencies have elected to present their financial statements on a combined basis. All significant interagency accounts and transactions have been eliminated in combination. The individual organizations comprising the Agencies and their purposes are as follows:

The VMI Alumni Association

The purpose of the VMI Alumni Association ("Alumni Association") is to organize the alumni of VMI into one general body.

VMI Foundation, Incorporated and Subsidiary

The purpose of the VMI Foundation, Incorporated and Subsidiary ("Foundation") is to solicit and to accept various funds and to disburse such funds, or income earned from those funds, for the advancement of VMI and the Alumni Association. The Foundation is the sole member of VMI Investment Holdings, LLC, responsible for the investments of the endowment.

VMI Alumni Agencies Board, Incorporated (formerly VMI Development Board, Incorporated)

During fiscal year 2018, the VMI Development Board, Incorporated amended its bylaws and changed its name to the VMI Alumni Agencies Board, Incorporated. The purpose of the VMI Alumni Agencies Board, Incorporated ("Alumni Agencies Board") is to receive, hold, and manage assets for any purpose on behalf of the Agencies and VMI.

VMI Keydet Club, Incorporated

The purpose of the VMI Keydet Club, Incorporated ("Keydet Club") is to support, strengthen, and develop the intercollegiate athletic program at VMI.

The VMI Alumni Agencies Personnel

Stephen M. Maconi, Chief Executive Officer & Secretary to the Board, Buena Vista, Virginia
David Prasnicki, Chief Financial Officer, Alumni Agencies, Lexington, Virginia
Amy F. Goetz, Chief Communications Officer, Lexington, Virginia
Thomas A. Brashears '95, Chief Operating Officer, VMI Alumni Association, Fairfield, Virginia
Warren J. Bryan '71, Chief Operating Officer, VMI Foundation, Lexington, Virginia
Meade B. King '85, Chief Operating Officer, VMI Keydet Club, Lexington, Virginia

VMI Parents Council

The VMI Parents Council was formed in 1957 to provide information and assistance to the parents of cadets attending VMI. Members of the Parents Council are selected from parents of cadets in the upper three classes. The purposes of the Parents Council are to develop closer ties between parents and VMI; to help parents serve as ambassadors for VMI; and to assist the Institute in providing for the welfare and development of cadets. The Council is to be a sounding board to help cadets and their families gain the most from VMI. If the Council can help a parent understand VMI and provide a ready source of information to all cadets and parents, then it has met its challenge. The Parents Council meets formally twice a year at VMI. The fall meeting is held on Parents Weekend. Council representatives regularly attend VMI events to answer questions and act as hosts and hostesses.

VMI Research Laboratories

VMI Research Laboratories, Inc. was established in 1963 by General George Shell, Superintendent. The mission of VMIRL is to facilitate the pursuit of research by faculty members at VMI through the administration of grants and contracts and sponsorship of research activities. The VMIRL Board of Directors oversees the activities of the labs and meets on an annual basis to review the yearly activities. Day-to-day administration of VMIRL is conducted by the Officers of the Corporation.

Since its inception, VMIRL has administered more than 260 grants and contracts totaling nearly $10,000,000. Faculty researchers at VMI have obtained financial support for their projects from federal sources such as NSF, NIH, NEH, Agricultural Research Service of the USDA, DOD, and the Army Research Institute, as well as from state resources, e.g., VDOT, Va. Department of Environmental Quality, Center for Innovative Technology, Va. Department of Health, Va. Department of Information Technology, and Va. Department of Technology Planning, and from private corporations such as Babcock and Wilcox, Jeffress Memorial Trust, Emhart Glass, Research Corp. of America, Ford Motor Corporation, and the Harrington Corporation.

Additionally, conferences such as Environment Virginia, COVITS, Virginia Transportation Conference, and Energy Virginia have been made possible in part through VMIRL sponsorship. Additionally, VMIRL administers the Stanley Wetmore Fund which provides monetary support for cadet research. VMIRL also sponsors two awards. The Maury and Hinman awards each recognize outstanding achievement in the area of faculty and cadet research efforts at the Institute.

Statistics

May 2019 Graduates by Curriculum

	Number Graduates	Distinguished Graduates
Applied Mathematics	9	3
Biology	26	3
Chemistry	7	3
Civil Engineering	43	8
Computer Science	23	2
Economics-Business	36	7
Electrical Engineering	17	5
English	6	2
History	19	4
International Studies	47	9
Mechanical Engineering	20	10
Modern Languages & Cultures	11	3
Physics	14	1
Psychology	25	5
Total	**303**	**65**

Recapitulation of Graduates

Total to May 16, 2018		23,791
	September, 2018	23
	December, 2018	24
	January, 2019	1
	May, 2019	303
	Total Graduated September 2018-May 2019	
Total to May 16, 2019		

Enrollment Summary Fall 2018

Opening enrollment for the 2018-2019 session included matriculation of 519 new cadets and registration of 1,192 old cadets. Under guidelines of the State Council of Higher Education for Virginia, the figures below represent Corps strength (1685) as of the drop-add census date of September 4, 2018.

Class Of	2019	2020	2021	2022	Total
Old Female Cadets	41	49	48	0	138
Old Male Cadets	332	344	378	0	1054
New Female Cadets	0	0	0	80	80
New Male Cadets	0	0	0	413	413
Total Female Cadets	41	49	48	80	218
Total Male Cadets	332	344	378	413	1467
Total Cadets	373	393	426	493	1685

Class Of	2019	2020	2021	2022	Total
Applied Mathematics	12	15	9	10	46
Biology	35	37	37	52	161
Chemistry	9	8	11	17	45
Civil Engineering	55	50	52	65	222
Computer Science	25	23	29	29	106
Economics / Business	52	53	58	52	215
Electrical/Comp Engineering	18	13	22	30	83
English	6	13	13	7	39
History	24	47	37	45	153
International Studies	55	48	54	58	215
Mechanical Engineering	24	33	51	63	171
Modern Languages & Cultures	10	7	4	14	35
Physics	19	7	11	14	51
Psychology	29	39	38	37	143
Total	**373**	**393**	**426**	**493**	**1685**

Geographical Distribution

Corps Of Cadets—Fall 2018 (Based on state/nation of legal residence)

U.S. Cadets

Legal Residence	2019	2020	2021	2022	Total
Alabama	3	1	1	6	11
Arizona	0	0	2	2	4
California	4	10	6	13	33
Colorado	3	3	3	8	17
Connecticut	3	3	4	1	11
Delaware	1	1	0	1	3
District of Columbia	0	0	0	1	1
Florida	5	7	9	8	29
Georgia	5	5	4	7	21
Hawaii	0	0	2	0	2
Illinois	3	5	8	1	17
Indiana	1	2	1	3	7
Kansas	0	0	0	1	1
Kentucky	2	3	0	2	7
Louisiana	0	1	1	0	2
Maryland	11	19	14	15	59
Massachusetts	3	6	5	6	20
Michigan	3	5	3	1	12
Minnesota	2	1	1	0	4
Mississippi	0	0	1	0	1
Missouri	0	1	1	2	4
Montana	0	0	1	0	1
Nebraska	0	0	0	1	1
Nevada	2	1	2	0	5
New Hampshire	2	1	1	0	4
New Jersey	11	4	15	14	44
New Mexico	0	1	0	0	1
New York	10	7	10	17	44
North Carolina	13	14	24	28	79
Ohio	2	3	5	2	12
Oklahoma	0	0	1	0	1
Oregon	0	1	1	3	5
Pennsylvania	20	14	14	20	68
Rhode Island	1	0	0	0	1
South Carolina	1	2	4	4	11
Tennessee	7	5	5	6	23
Texas	6	12	8	16	42
Virginia	235	242	256	289	1022
Washington	3	4	2	0	9
West Virginia	1	1	4	2	8
Wisconsin	3	0	0	0	3
Wyoming	0	1	0	0	1
Armed Forces Europe	1	0	1	0	2
Guam	0	1	0	0	1
Total	**367**	**387**	**420**	**480**	**1654**

Foreign Cadets

Legal Residence	2019	2020	2021	2022	Total
Bulgaria	0	0	0	1	1
China	0	2	1	7	10
Indonesia	1	0	0	0	1
Puerto Rico	0	0	0	1	1
Switzerland	0	0	0	1	1
Taiwan	4	3	4	0	11
Thailand	1	1	1	2	5
United Kingdom	0	0	0	1	1
Total	**6**	**6**	**6**	**13**	**31**

All Cadets

Legal Residence	2019	2020	2021	2022	Total
Total:	**373**	**393**	**426**	**493**	**1685**