

2011-2012 CATALOGUE



VMI

Don't Do Ordinary

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
Parents Council — Parents Council Liaison — 464-7072
Parents Weekend, and Related Matters—Deputy Commandant for Cadet Life—464-7325
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 Sports Information—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
Training and Investigations Officer — 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

Consistent with Federal and State law, the Virginia Military Institute does not discriminate against employees, cadets, or applicants on the basis of race, color, sex, age, veteran status, national origin, or disability in its programs or activities. Every VMI staff member, faculty member and cadet has the right to work and study in an environment free from discrimination and should be treated with dignity and respect. VMI complaint and grievance procedures provide employees and cadets with the means for resolving complaints that this Statement has been violated. VMI is an Equal Opportunity Employer. Anyone having questions concerning discrimination or the application of Title IX regulations should contact 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 Employee Disability Services Coordinator in the VMI Human Resources Office, Lexington, Va. 24450, (540) 464-7322.

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INSTITUTE CALENDAR 2011-2012

CRITICAL DATES AND ACADEMIC CALENDAR

FIRST SEMESTER – 2011

New cadets matriculate (Cameron Hall)	Sat, 20 Aug
Old Corps returns.....	Sun (2200), 28 Aug
Registration	Mon, 29 Aug
Classes begin.....	Tue, 30 Aug
Academic Convocation	Mon, 5 Sep
Last day for course or curriculum change.....	Tue, 6 Sep
1st Fall Reunion Weekend	Fri-Sat, 9-10 Sep
Fall FTX (Army only)	Fri (CAD)-Sun, 7-9 Oct
Parents Weekend	Fri-Sun, 14-16 Oct
Homecoming Weekend	Fri-Sun, 21-23 Oct
2nd Fall Reunion Weekend	Fri-Sat, 21-22 Oct
Founders Day (no classes)	Fri, 11 Nov
Ring Figure	Fri, 18 Nov
Thanksgiving Furlough	Tue (CAD)-Sun (2200), 22-27 Nov
Classes end.....	Mon, 12 Dec
Reading day	Tue, 13 Dec
Exams	Wed-Wed, 14-21 Dec
December Joint Commissioning Ceremony.....	Tue, 20 Dec
December Graduation.....	Tue, 20 Dec
Christmas Furlough begins (CAD).....	Wed, 21 Dec

SECOND SEMESTER – 2012

Christmas Furlough ends	Tue (2200), 10 Jan
Registration	Wed, 11 Jan
Classes begin.....	Thu, 12 Jan
Last day for curriculum and course changes.....	Thu, 19 Jan
Spring Furlough	Fri (CAD)-Sun (2200), 9-18 Mar
Spring FTX (No classes Fri & Mon).....	Thu (CAD)-Mon, 29 Mar-2 Apr
Easter Break	Fri (CAD)-Mon (2200) 6-9 Apr
Early Spring Reunion.....	Mon-Tue, 23-24 Apr
Spring Reunion Weekend	Fri-Sat, 27-28 Apr
Classes end.....	Wed, 2 May
Reading day	Thu, 3 May
Exams	Fri-Fri, 4-11 May
Institute Awards Ceremony	Mon, 14 May
Commissioning Ceremony	Tue, 15 May
New Market Day Ceremony	Tue, 15 May
Commencement.....	Wed, 16 May

Class Changes:

First Semester: Friday classes meet on Tuesday, 22 November

Second Semester: TBD

NOTE: Dates are subject to change by Official Published Orders.

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.

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, heroes, 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, 39 college presidents and 266 generals and flag officers. VMI Superintendent General J.H. Binford Peay III '62

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.

attained the rank of four-star general. He served his country as Vice Chief of Staff for the U.S. Army and Commander-in-Chief, United States Central Command. He directed strategic and operational matters in the Persian Gulf, Africa, South Asia and the Middle East. As a commanding general of the 101st Airborne Division, General Peay led the division during operations Desert Shield and Desert Storm. He has won numerous military awards and decorations. General Peay knows as well as anyone that VMI builds leaders. "My father, my two sons and I all graduated from VMI and I feel very strongly about the Institute's contribution to Virginia and the nation," said Peay.

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.

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.

The arsenal guard of some 20 soldiers, although living a strict military life while on duty, lacked self-discipline, and their leisure-time activities upset the decorum of Lexington. 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."

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 50-year 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. At the outbreak of the Civil War, he resumed military duty and became a general of the Confederate forces,

earning the name “Stonewall” Jackson. He is considered one of the greatest commanders in military history. 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.

With the outbreak of the war, the Cadet Corps, under command of its professor of physics, Major Jackson, was ordered to train recruits for the Confederate Army in the Richmond area. The Corps was later reconstituted at the Institute to supply officers for the Southern armies. The Cadet Corps was called into active service a number of times in the Valley of Virginia during the next three years.

On May 15, 1863, the Corps of Cadets escorted the body of “Stonewall” Jackson to his grave in Lexington, after his death in the battle of Chancellorsville. Just before the battle, Jackson, after surveying the field and seeing so many VMI men around him in key positions, spoke the oft-quoted words: “The Institute will be heard from today.”

One year to the day after the funeral of Jackson, the VMI Cadet Corps was engaged as a unit in pitched battle, the only instance in American history of an entire student body serving in battle together. Called upon to bolster the Southern line against the advance of Union General Franz Sigel, the Corps marched down the valley to New Market and, in the battle fought there, won credit for helping turn the tide in favor of the Confederate forces. Ten cadets were killed and 47 wounded. 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.

The Institute was shelled and burned on June 12, 1864, by Union forces under the command of General David Hunter. The courageous 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. 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 Lesser Saint 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, and the Vietnam War, over 300 alumni gave the ultimate sacrifice in service to their country, and two alumni were killed during Operation Desert Storm. Two VMI alumni were among those killed on September 11, 2001 in the terrorist attacks on America and 10 alumni have been killed in Iraq and Afghanistan.

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.

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 DOD 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 unit
Advanced mathematics	1 unit
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.

Summary. 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>) 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. All applicants, including transfers, must submit the following items (additional items required for transfers will be explained when receipt of application is acknowledged):

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. 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 PLACEMENT

Advanced placement 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. Below are listed the AP Examinations VMI currently accepts for credit. Semester hour credit may be awarded for grades of 4 or 5 (honors and high honors), with placement credit for a score of 3, except as indicated below. Electives must be taken to fill the credit hour requirement.

College Board Advanced Placement Summary

AP Examination	VMI Equivalent	Credit Hours
Art-Studio (Drawing/2-D/3-D)	FA 215-216	2
Art History	FA 251-252	6
Biology	BI 101-102	8***
Chemistry	****	TBD
Computer Science A	CS 121	3
Computer Science AB	CS 121-122	6
Calculus AB	MA 123	3
Calculus BC	MA 123-124	6
Economics-Micro	EC 201	3
Economics-Macro	EC 202	3
English Literature/Comp.	WR 101-102	6
English Language/Comp.	WR 101-102	6
French-Language	FR 101-102	6*
French-Literature	TBD	TBD**
German-Language	GR 101-102	6*
Government and Politics-US	IS 210	3
Government and Politics-Comp.	IS 330	3
History-US	HI 205-206	6
History-European	HI 104	3*****
History-World	HI 104	6
Latin-Literature	No VMI equivalent	N/A
Music Theory	FA 342	1
Physics B (Liberal Arts Major)	PY 120-121	6
Physics C (All Curricula)	PY 160-161	8
Psychology	PS 201	3
Spanish-Language	SP 101-102	6*
Spanish-Literature	TBD	TBD**
Statistics	MA 106 or MA 108	3

*Score of 3=Placement credit for 101 and 102; 4=Semester hour credit for 101 and 102 (6 credits); 5=Semester hour credit for 101/102 and 201/202 (12 credits).

**TBD by interview with faculty member.

***No credit for a score of 3 for biology majors.

****Chemistry majors must take first-year chemistry; all others will receive credit depending upon score and curriculum.

*****No credit for score of 3.

Questions pertaining in International Baccalaureate or Advanced Placement Credit may be directed to VMI's Transfer Credit Coordinator, LTC Neil Whitmore at whitmorend@vmi.edu or 540-464-7039.

Updated information pertaining to VMI's IB, AP and transfer credit practices may be found at http://www.vmi.edu/Admissions.aspx?id=226&ekmense1=fb5d653b_20_0_226_4.

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. Placement credit is awarded for scores of

4, except as indicated below. Electives must be taken to fill the credit hour requirement.

International Baccalaureate Summary

H=Higher Level Exam, S=Standard Level Exam

IB Examination	VMI Equivalent	Credit Hours
Art/Design (HL/SL)	FA 215-216	2
Biology (HL/SL)	BI 101-102	8
Business and Organization (HL/SL)	BU 220/230	6
Chemistry (HL)	CH 137-138 w/labs	8
General Chemistry (SL)	CH 137-138 w/labs	8
Applied Chemistry (SL)	CH 131-132 w/labs	8
Computing Studies (HL/SL)	CS 316	3
Economics (HL/SL)	EC 201-202	6
English A1 (HL/SL)	WR 101/102	6****
English B (HL/SL)	WR 101/102	6****
Pilot-English B (HL/SL)	WR 101/102	6****
French A1 (HL/SL)	FR 101-102	6*
French B (HL/SL)	FR 101-102	6*
Geography (HL)	Elective credit	3**
Geography (SL)	N/A	0
German A1 (HL/SL)	GR 101-102	6*
German B (HL/SL)	GR 101-102	6*
History (HL)	HI 104	3****
History (SL)	HI 104	3*****
Latin (HL/SL)	TBD	TBD***
Mathematical Methods (SL)	Math Elective	6
Advanced Mathematics (SL)	MA 401	3
Mathematical Studies (SL)	MA 114	3
Mathematics (HL)	MA 123-124	6
Music (HL/SL)	FA 342	1
Philosophy (HL/SL)	PH 305	3
Psychology (HL/SL)	PS 201	3
Social Anthropology	Free Elective	3
Spanish Ab Initio	SP 101-102	6
Spanish A1 (HL/SL)	SP 101-102	6*
Spanish B (HL/SL)	SP 101-102	6*

Earned credit of additional subject areas will be evaluated for elective credit based on the topic area and earned score above 5.

* Scores of 5 or 6 (6 hours credit); 7 (12 hours credit)

** For History/IS majors only

***To be determined by modern languages department head review

****Score of 5 (placement credit); 6 or 7 (semester hour credit); no credit for score of 4

*****Score of 6 (placement credit); 7 (semester hour credit); no credit for score of 4 or 5.

For more information, contact VMI's Transfer Coordinator.

3. VMI Placement Examinations. All new cadets are tested for placement in the proper level math 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.

4. 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.

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 matriculating with advanced standing credit will be credited with appropriate time reduction based on transferred activity, but must complete a minimum of four semesters and 50% of their academic activity in residence at VMI. Cadets matriculating with no advance standing credit must complete a minimum of six semesters or 75% of their degree requirements in residence at VMI.

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.

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.

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.

6. **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.

7. **Waiver of transferable credits.** An applicant may waive 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.

8. **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.

9. **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.
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

The general-use cadet microcomputer labs use Microsoft Office as the standard software for word processing, spreadsheets, etc. VMI uses computers extensively in classes across the entire range of curricular offerings. Students matriculating at VMI should be well-versed in computing.

Increasingly, VMI is becoming an electronic community, committing substantial resources to the effective use of technology in teaching, communication, and information management across Post. As part of their core curriculum experience, cadets are therefore required to demonstrate basic competency in the following Microsoft Office applications: Word, Excel, Outlook, and Power Point. Individual departments may require competency at higher levels and in particular software or additional areas.

The Institute provides technical support for the following Microsoft programs, which will be used to assess the basic competencies; Word, Outlook, Excel, and PowerPoint.

VMI furnishes over 200 computers for cadet use in academic buildings and laboratories. VMI does not provide computers for individual cadet use but does provide a computer lab in the barracks that is open 24 hours per day, seven days per week. Barracks is wired to allow cadets access to the VMI network and the Internet from their rooms. Computer labs are located in each academic building along with barracks which provide computing facilities for all cadets. Numerous areas throughout the Post have wireless networking capabilities available.

Computer support for cadet-owned computers is offered through the Information Technology Department. Cadets who wish to bring a computer for use in Barracks must only bring a laptop (notebook) computer because of their portability, space efficiency, and low power consumption. Cadets who purchase the recommended laptop will receive priority support enabling a faster "turn around time" for service. Additionally special pricing on the Premiere page includes an onsite hardware warranty with accidental damage coverage. The Information Technology Barracks Help Desk is the central location for technical support for cadets. The Barracks Help Desk provides answers to technical questions, account password assistance, as well as troubleshooting and repair of cadet owned computers. Barracks Help Desk technicians are available from Sunday afternoon through Friday afternoon. Computer support also includes documentation on the VMI web in the form of FAQ's and self help documentation. The cadet computer support page can be found at: <http://www.vmi.edu/ccs>.

Cadets also benefit from the "Microsoft Campus Agreement". This agreement allows cadets to use VMI licensed Microsoft Operating System and Office suite software on their computers at no cost to the cadet. Cadets purchasing the recommended laptop models receive their computers preloaded with VMI licensed software. All computers require a network interface card (not a modem) to connect to the VMI Local Area Network. Specific information regarding support of cadet owned computers may

be found on the VMI web page at: <http://www.vmi.edu/ccs> or by contacting the Information Technology Help Desk at Help@vmi.edu or by phone at 540-464-7643.

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.

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 www.vmi.edu/readmin.

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.

COSTS AND PAYMENT SCHEDULE

TUITION, FEES, AND DEPOSITS 2011-2012 SESSION

	Virginia Cadets	Non-Virginia Cadets
Tuition	6,622	25,602
Room and Board	7,446	7,446
Auxiliary Fee	3,862	3,862
Total tuition and fees	\$17,930	\$36,910
Quartermaster charge	2,700	2,700
Sub-Total	\$20,630	\$39,610
Security deposit	200	200
TOTAL DUE	\$20,830	\$39,810

Tuition and fees are based upon appropriations by the General Assembly. These appropriations are subject to state revenue collections; therefore, appropriations may be reduced by the Governor should there be a shortfall in state revenue. Accordingly, the VMI Board of Visitors reserves the right to adjust tuition and fees at any time during the year.

Room and board fees are required since all cadets live in Barracks and are provided twenty-one meals per week.

The **auxiliary fee** covers the cadet's share of the costs of medical services, cadet activities/facilities, athletics and other services.

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. These costs are rarely included in cost figures at other colleges, but should be taken into account when comparing college costs.

Qualified cadets will receive an ROTC uniform allowance from the Federal Government to help defray the cost of cadet uniforms. The annual allowance is approximately \$900.

The **security deposit** covers property damages, lost property, and unpaid obligations to VMI. The deposit shall equal \$200 at the beginning of each academic year; accordingly, any shortfall is billed at the beginning of each year. VMI returns this deposit, less any deductions and without interest, upon graduation or termination of the cadetship.

PAYMENT SCHEDULE

	Virginia Cadets	Non-Virginia Cadets
Reservation Fee	\$ 300	\$ 300
Due August 1	\$10,215	\$19,705
Due December 15	\$10,315	\$19,805

On or about 1 July and 7 November, VMI will send an e-mail message to cadets and authorized bill payers indicating that bills and payment instructions are available for viewing on VMI's website (the message will contain instructions for accessing this information).

VMI shall assess a late fee of \$100 or 10% of the unpaid balance, if less, for failure to pay tuition, fees, and deposits by the due date. VMI may dismiss cadets from the Institute for failure to pay tuition and fees or any other financial obligation to the Institute as required. The Institute also reserves the right to hold grades, credits, transcripts, and diplomas until all financial obligations to the Institute have been satisfied. Cadets must satisfy all financial obligations to the Institute for past semesters or terms before they are allowed to register for any succeeding semester or term.

RESERVATION FEE

A reservation fee of \$300 is required of all cadets and is applied toward total costs. It is refundable to those who do not enroll if requested in writing before May 1. Refunds after that date will be made only to cadets who withdraw because of academic or medical deficiencies prior to matriculation or registration.

OTHER COSTS

Other costs include textbooks, supplies, automobile registration, and non-issue clothing. Cadets must pay for such items with cash, check, or debit/credit card at the time of purchase.

The cadet newspaper, yearbook and literary magazine are optional and are billed separately by the various cadet organizations.

REFUND POLICY

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

1. Full refunds, **less \$1,000** are made for withdrawals prior to the first day of classes.
2. On or after the first day of classes, refunds are prorated through the fifth week.
3. No refunds are made after the fifth week of classes.
4. 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 23-7.4 of the Code of Virginia.

After admission, it is the duty of the cadet to promptly provide written notification to the VMI Registrar of any changes of address or domiciliary status.

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 up to approximately \$3,600 over four years.
- * 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).

SENIOR CITIZENS

Pursuant to Virginia Senior Citizen's Higher Education Act, any individual over the age of 60, who is a Virginia domiciliary and earns less than \$15,000 annually, and who otherwise meets the admission criteria of the Virginia Military Institute (See admission section pages 6-9.) 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.

FINANCIAL AID

The purpose of the VMI financial aid program is to provide monetary assistance to cadets who, without such aid, would be unable to attend; and to provide aid to cadets with superior abilities. 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 www.fafsa.ed.gov.

Sources of aid at VMI include Perkins Loans; Pell Grants; Supplemental Educational Opportunity Grants; College Work Study; State Undergraduate Grants; VMI Board of Visitors scholarships; VMI Foundation, Inc. scholarships; merit scholarships; athletic scholarships; and ROTC scholarships.

For upper classmen only, there are self-help jobs available in libraries, departmental offices, laboratories, the Cadet Center, and the VMI Mess Hall.

Cadets may apply also for Stafford loans, which are available regardless of need. Cadets must apply for financial aid before they can submit a Stafford Loan application. Parents can borrow up to the full cost of their child's education, minus any aid their child is eligible to receive through the PLUS loan program. VMI participates in the Federal Direct Loan Program.

Normally, payment of all financial aid stipends 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 credits will be pro-rated.

Renewal of financial aid is not automatic. Cadets must apply for aid each year by submitting a completed FAFSA and the VMI Financial Aid Application. The FAFSA may be completed on-line at www.fafsa.ed.gov.

ROTC Scholarships. For information on applying for such grants, see page 28.

State Cadets. These are residents of Virginia who receive special appointments by the Board of Visitors, as specified in the Code of Virginia. State Cadets are exempt from payment of tuition and board, but pay all other 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 March 1 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—Generous Institute Scholarships 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 1300 (combined) on the SAT or at least 29 on the ACT, have a high school GPA of at least 3.6, and rank in the top 10 percent of their high school class. Selection is based on merit; financial need

is not a criterion. Institute Scholarships are renewable annually as long as the recipients maintain 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 cadets must complete the FAFSA by 1 March. Returning cadets should complete the FAFSA by 1 April.

The forms to be completed are as follows:

1. The Free Application for Federal Student Aid (FAFSA) is mandatory, and it may be completed on the internet at www.fafsa.ed.gov/. 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.
2. VMI Financial Aid Application.

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

Final decisions on financial aid awards are completed by mid-April and applicants normally are notified no later than early May.

FINANCIAL AID AWARDS

Awards consist of grants, scholarships, work-study, and loans and are awarded based on **demonstrated financial need**. A complete listing of VMI scholarships including applicable federal and state programs is available on the VMI Financial Aid Office website at <http://www.vmi.edu/financialaid>.

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. On determination of eligibility by the Director of the Division of War Veteran's Claims, tuition and required fees will be waived. In addition, as funds are available, eligible students may receive a stipend to offset other educational expenses.

For more information telephone the VMI Financial Aid Office at 540-464-7208 or call the Dept. of Veterans Services at 540-857-7101.

To receive benefits under the new GI Bill program, the student/parent must apply to the VA online. All eligible students must ten bring their "Certificate of 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.

THE ACADEMIC PROGRAM

ACCREDITATION

Virginia Military Institute is accredited by the Commission on Colleges of the Southern Association of Colleges and Schools (1866 Southern Lane, Decatur, Georgia 30033-4097; Telephone number 404-679-4501) to award Bachelor of Arts and Bachelor of Science degrees. Any inquiries to the Commission should relate only to the accreditation status of VMI and not to general admission information. It 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, electrical and computer, and mechanical engineering curricula are accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET). The computer science curriculum is accredited by the Computing Accreditation Commission of ABET. 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.

I. Key Competencies	
A. Written Communication (WR 101-102) ¹	6 hours
B. Oral Communication (SE 300)	1 hour
C. Scientific Analysis (approved BI, CH, or PY sequence)	8 hours
D. Mathematical Reasoning (approved MA sequence)	6 hours
E. Physical Education (seven semesters)	4 hours
II. Foundations of Citizenship and Leadership	
A. Reserve Officers Training Corps (ROTC)	8 hours
B. Leadership in Organizations (PS 344)	3 hours
III. Perspectives on Civilization and Human Achievement	
A. World History (HI 103-104)	6 hours
B. Civilizations and Cultures (two approved electives) ²	6 hours
IV. Integrative Experiences	
A. Writing-Intensive Courses ³	variable
B. Capstone Experience	variable

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.

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, but transfer from one major field of study to another is permitted. (Some restrictions do apply.)

A cadet may be awarded the degree of Bachelor of Science with a major in applied mathematics, chemistry, civil engineering, computer science, electrical and computer engineering, mechanical engineering, physics 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, modern languages and cultures, or psychology. Either a Bachelor of Science degree or a Bachelor of Arts degree may be awarded in biology, chemistry or psychology. Detailed description of majors begins on page 34.

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.

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 "Curricula" in this catalog.

Minors

Sponsoring Department	Area
Physics and Astronomy.....	Astronomy
Economics and Business.....	Business
Chemistry.....	Chemistry
Electrical and Computer Engineering.....	Computer Engineering
Math and Computer Science.....	Computer Science
Economics and Business.....	Economics
English and Fine Arts.....	English
English and Fine Arts.....	Fine Arts
History.....	History
Math and Computer Science.....	Information Technology & Design
International Studies.....	International Studies
Psychology & Philosophy.....	Leadership Studies
Math and Computer Science.....	Mathematics
History.....	Military History
Modern Languages & Cultures.....	Modern Languages & Cultures
Modern Languages & Cultures.....	Modern Languages - Arabic
Modern Languages & Cultures.....	Modern Languages - French
Modern Languages & Cultures.....	Modern Languages - German
Modern Languages & Cultures.....	Modern Languages - Japanese
Modern Languages & Cultures.....	Modern Languages - Spanish
Mechanical Engineering.....	Nuclear Engineering
Psychology & Philosophy.....	Philosophy
Physics and Astronomy.....	Physics
Psychology & Philosophy.....	Psychology
International Studies.....	Science and Security
English and Fine Arts.....	Writing

Concentrations

Curriculum	Area
Mechanical Engineering.....	Aerospace Engineering
Biology & Chemistry.....	Biochemistry and Molecular Biology
Biology.....	Ecology, Conservation and Organismal Sciences
Economics and Business.....	Financial Management
English and Fine Arts.....	Fine Arts
International Studies.....	Interdisciplinary Studies in Latin America
Electrical and Computer Engineering.....	Microelectronic Engineering
History.....	Military History
Mechanical Engineering.....	Nuclear Engineering
Physics.....	Nuclear Energy
English and Fine Arts.....	Writing

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 (V-CUR) was established to more fully integrate student scholarly inquiry into the VMI academic experience. The program is founded on the premise that the most meaningful academic experiences of college students come through one-on-one interactions with faculty advisers outside the traditional classroom environment. To expand the number and quality of those interactions at VMI, 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; Wetmore Fund for cadet academic year research; and a variety of awards for both cadets and faculty who wish to pursue research projects. For more information, contact the Director of Undergraduate Research, 302 Maury-Brook 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 (WR 101 and WR 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 technical, professional, or creative writing. Cadets' study in the writing curriculum is enhanced by tutors 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 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, 210 Science Building.

ACADEMIC SUPPORT

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

Advising. Advising is one of the most important academic support programs at the Institute. Academic advising is a four-year developmental process in which the advisor both supports and challenges the cadet in an effort to increase the cadet's confidence and self-sufficiency. The cadet seeks assistance from the faculty advisor and other VMI personnel to explore and clarify academic, career and life goals. Upon entry into VMI, each cadet is assigned an academic 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 cadet's transition into the VMI culture, assist the cadet in mastering the academic policies and regulations, and assist the cadet in coordinating the demands of a multi-faceted academic and co-curricular experience. VMI also sponsors an Athletic Advising Program to help scholar-athletes keep their focus on academics. For information about advising, contact the Associate Registrar for Advising Support, mckelveys@vmi.edu, 301 Shell Hall.

Center for Cadet Counseling. In the Col. Mike E. "Doc" Mousour Center for Cadet Development and Counseling, professional counselors work to facilitate the personal development of cadets to meet their full academic and personal potential and to promote the health and wellness of cadets. The center provides short-term counseling to address personal concerns that may impede current and future learning and personal development. Counselors may also provide crisis intervention services to prevent, resolve, and/or minimize the effects of crises on cadets and the Institute community. The center provides speakers and facilitators for psycho-educational, wellness-focused programs, including training for cadet groups, guest lecturers in classes, special interest speakers at events, and facilitators for group discussions. Counselors may consult with VMI employees, cadets, and family members who are concerned about cadets. Although all counseling information is confidential, counselors can offer general recommendations on assisting cadets that are having difficulties.

Information Technology. The mission of Information Technology is to help plan, implement, serve, and support the technology needs of the Institute and facilitate creativity in teaching, learning, and communication for cadets, faculty, administration, and staff. In addition to services for cadets, including maintenance of four computer labs across Post, VMI provides the VMI faculty and staff with Help Desk support, hardware / software recommendations and installations, troubleshooting, and training classes. VMI is responsible for the VMI Local Area Network, and can provide access upon request. VMI is located in 427 Nichols Engineering Building.

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; to support the creation and use of multimedia by cadets and faculty; 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. The building is equipped with 32 public-access, networked computers for research use, and a computer instruction lab which enables librarians to offer hands-on training for online resources. Preston Library has 110 individual study carrels that are available on a first come, first serve basis. Carrels are equipped with study lamps, power outlets, and network connections. Ten group study rooms are available in addition to many large tables for study and research. Each floor has a gallery area furnished with armchairs and sofas. All areas of the library have wireless access. The library maintains a music collection in the Timmins Music Room.

Preston Library's collections include over 300,000 volumes of print materials, over 5,000 non-print items, and more than 200 scientific, literary, and general interest print periodicals. The Library installed an integrated library system in 1991 and upgraded its system in 2004. The online catalog is available at library.vmi.edu. In addition, the library provides access to more than 100 full-text and citation databases and over 100,000 full-text electronic journals, many available through VIVA (the Virtual Library of Virginia). Preston Library is a selective depository of U.S. government publications, with current holdings of about 200,000 federal and state documents. Interlibrary loan service is available to cadets and faculty free of charge. Preston Library maintains a web presence at www.vmi.edu/library and a blog at Prestonlibrary.net/blog.

Media Services and the VMI Archives are located within the library. Media Services has 18 media carrels, two media creation

rooms, and a media projection room for classes to view videos. The Archives contains VMI's historic official records, photographs, manuscripts, and rare materials. It maintains a web presence at www.vmi.edu/archives.

Miller Academic Center. The Miller Academic Center is located in Carroll Hall and provides special programs and support services to cadets. There are two offices within the Miller Academic Center: Learning Programs, and Disabilities Services. The Writing Center and the Math Resources Center, also located in Carroll Hall, provide tutoring services to cadets. Cadets interested in learning more about these programs and services should visit the Miller Academic Center or telephone (540) 464-7661.

Learning Programs help cadets at all levels enhance their potential for success in college and in life. Programs are grounded in current research and designed to teach learning strategies (note-taking, textbook reading, test preparation and test-taking) and develop life skills, especially Executive Functions, which are higher level process that direct self-awareness and self-regulation of thoughts, emotions, and behavior. Included among Executive Functions are critical skills for success, such as goal-setting, attention, memory, strategy shifting, problem solving, resource utilization, planning, prioritizing, impulse control, resilience, and perseverance. *Programs include individual and small group academic coaching, peer mentoring, PASS (tutoring), and workshops.*

Disabilities Services works to provide all cadets with an equal opportunity to achieve academic success. Cadets with learning disabilities meet with the Director of Disabilities Services to develop individual support programs, including classroom accommodations. Cadets who have never been tested for a learning disability may be screened on Post at no cost and, if warranted, may choose to be tested by a specialist off Post at their own expense.

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/AcadRegulations>. 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.

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/AcadPolicy>.

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.

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 Associate Dean for Assessment and Advising; the Assistant Dean for Planning and Administration; the Registrar; the Institute Director of Writing; the Head Librarian; the Engineering Coordinator; and the ROTC Coordinator, 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 <http://www.vmi.edu/dean>.

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; the word "certified" on a paper means that the work is the cadet's own and that the cadet has neither given nor received help.

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 four rifle companies each plus 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. Fourth Class cadets 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 perfection of 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.

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-times 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 attention, 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 Office of Cadet Life.

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, wrestle in a muddy pit, 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

Numerous opportunities are provided to encourage and develop the faith of our cadets. The Institute Chaplain oversees and develops ministry to nurture the Christian faith of our Corps. A non-denominational 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. A weekly prayer breakfast and a discipleship breakfast meeting are conducted each week where adult mentors meet with these students. The Baptist Student Union, Fellowship of Christian Athletes, Newman Club and Officer's Christian Fellowship meet the spiritual needs of a number of our cadets.

More than a dozen churches 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.

From its founding, VMI has had a significant regard for faith. Francis H. Smith, builder and rebuilders of the Institute met often with cadets for times of prayer. Stonewall Jackson maintained a regular place for prayer in his life while he served as a professor at the Institute. Therefore every effort is made at the Institute to foster and nurture a genuine, personal, meaningful faith.

The religious convictions of our students are respected regardless of one's faith preference. While the Institute has a Christian Chaplain, the religious freedom of all students is assured through the Chaplain's guardianship.

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

- Beta Gamma Sigma, an honor society in business
- 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 Office of Cadet Life manages over 50 cadet clubs, club sports and organizations at VMI. These include the Big Brother/Big Sister, Civil War Roundtable, Timber Framers, College Republicans, College Democrats, Baseball, Golf, Lacrosse, Martial Arts, Women's & Men's Rugby, Wrestling, Grappling, Marathon, Strength, Triathlon, Ultimate Disc Golf, Trap & Skeet, Men in Grey, Jazz Band, Boxing, Ice Hockey, Soccer, and Basketball. VMI is committed to providing opportunities for all cadets to participate in clubs, organizations, and 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 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.

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. The band also performs in Presidential and Gubernatorial inaugural parades in Washington and Richmond. Within the band are smaller units such as the Pep Band, Brass Ensemble, Commanders (a dance band, which performs for dances and concerts both on and off post), Herald Trumpets, Quintet, VMI Drummers, and others.

The VMI Pipes and Drums provide 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 30 cadets from all classes.

The Timmins-Gentry Music Society maintains a music collection in a room in the library to foster interest in classical music within the Corps. The English and Fine Arts Department and this society sponsor concerts at VMI that are offered to the entire Corps at no admission charge. The Society sponsors trips to musical events in nearby cities, and each spring members travel to New York to attend the Metropolitan Opera and the New York Philharmonic.

Social Events

The Regimental S-7 is responsible for the Corps' social events such as movie nights, concerts and mixers. The Office of Cadet Life also oversees many social events throughout the year to include the Midwinter Formal, Ring Figure Weekend, Homecoming Hop and the Cadet Life Ski Trip.

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.

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.

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 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.

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.

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 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.

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.

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 first-standing 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 Northern 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.

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.

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.

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.

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.

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.

ATHLETIC AWARDS

The Almond Award. To the graduating cadet who has, throughout his career, demonstrated outstanding contributions to intercollegiate athletics while distinguishing himself through academic achievement and soldierly bearing and aptitude.

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 each year in physical fitness, the highest percentage of the company who participated in an NCAA or club sport and the highest pass rate on the VFT per semester and combined for the academic year.

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.

HEALTH SERVICES

An annual fee, included among the fixed fees listed elsewhere in this catalogue, provides for routine medical and psychological care. The VMI Health Center 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 full-time physician is 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, the physician makes arrangements 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 all cadets which will cover up to \$5,000 for any injury. 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. (www.acsa.com) **All correspondence having to do with the primary insurance should be directed to the insurance agent and not to the Institute or any of its offices.**

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.

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 drugs is a dismissal offense. Any conviction of an honor violation is a dismissal offense.**

Demerits, restriction to 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.

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 should assist in its enforcement by not providing automobiles. Violation of this rule may result in suspension.

MARRIAGE AND PARENTHOOD

Marriage and/or parenthood constitutes a disqualification for admission to the Institute as a cadet. A cadet who gets married or becomes a parent during the period of cadetship is expected to resign.

CHOICE OF CAREER

VMI has been privileged by a solid record as a learning model that prepares leaders of business, education and government. The unique combination of activities in the classroom, co-curricular and barracks life distinguish graduates with the ability to function in a variety of settings and achieve noteworthy results. The concept of citizen-soldier encompasses the ideal that the VMI experience prepares graduates to become useful members of society. In general, VMI's technical curricula teach more immediately employment related skills, whereas the non-technical curricula provide a more broadly-based body of knowledge in the arts and sciences, with emphasis in a particular academic discipline. However, the choosing of a particular major in which to specialize need not exclude a cadet from a particular career, because all curricula provide the basic educational foundation essential for a variety of occupations.

Employers, as well as graduate and professional schools, value the individual who uses words with clarity and force, who possesses the capacity to handle abstract and quantitative ideas, who effectively works harmoniously and productively with others, who understands human institutions and the social and economic environment, and who thinks independently. Personal attributes of integrity and dependability are of great worth. Development of such basic abilities is not the monopoly of any course or curriculum, or even of the academic program itself, for at VMI it is the total program of academic, military, and extracurricular activity that fosters such development.

If leadership may be defined as the ability to organize and effectively direct one's own time and energies and to aid others to do the same, then the life of a cadet is a real as opposed to an imaginary experience in applied leadership. Accordingly, success within the challenging VMI system requires the development of leadership abilities, qualities that have been most favorably noted by employers of our graduates. Career opportunities are especially open to those who have demonstrated the capacity to work hard to achieve worthy goals. In short, the Virginia Military Institute strives to provide a climate in which a student may become an educated, healthy, whole person.

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.

FERPA/STUDENT RECORDS

The Family Educational Rights and Privacy Act (FERPA) affords students certain rights with respect to their education records. They are:

(1) The right to inspect and review the student's education records within 45 days of the day the Institute receives a request for access.

Students should submit to the registrar, dean, head of the academic department, or other appropriate official, written requests that identify the record(s) they wish to inspect. The Institute official will make arrangements for access and notify the student of the time and place where the records may be inspected. If the records are not maintained by the Institute official to whom the request was submitted, that official shall advise the student of the correct official to whom the request should be addressed.

(2) The right to request amendment of the student's education records that the student believes are inaccurate or misleading.

Students may ask the Institute to amend a record that they believe is inaccurate or misleading. They should write the Institute official responsible for the record, clearly identify the part of the record they want changed, and specify why it is inaccurate or misleading.

If the Institute determines not to amend the record as requested by the student, the Institute will notify the student of the decision and advise the student of his or her right to a hearing regarding the request for amendment. Additional information regarding the hearing procedures will be provided to the student when notified of the right to a hearing.

(3) The right to consent to disclosures of personally identifiable information contained in the student's education records, except to the extent that FERPA authorizes disclosure without consent.

One exception which permits disclosure without consent is disclosure to school officials with legitimate educational interests. A school official is a person employed by the Institute in an administrative, supervisory, academic or research, or support staff position (including law enforcement unit personnel and health staff); a person or company with whom the Institute has contracted (such as the National Student Clearinghouse, non-faculty adviser, attorney, auditor, or collection agent); a person serving on the Board of Visitors; or a student serving on an official committee, such as a honor court, disciplinary or grievance committee, or assisting another school official in performing his or her tasks.

A school official has a legitimate educational interest if the official needs to review an education record in order to fulfill his or her professional responsibility.

(4) The right to file a complaint with the U.S. Department of Education concerning alleged failures by Virginia Military Institute to comply with the requirements of FERPA. The name and address of the office that administers FERPA is:

Family Policy Compliance Office
U.S. Department of Education
600 Independence Avenue, SW
Washington, DC 20202-4605

Virginia Military Institute complies with FERPA regulations and guidelines. For an up-to-date listing of FERPA policies please visit the Virginia Military Institute website at <http://www.vmi.edu/registrar>.

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 off-post 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, 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.

RELEASE OF DIRECTORY INFORMATION

Virginia Military Institute has designated the following items as directory information: name, affirmation or whether currently enrolled, dates of enrollment, academic major, academic and matriculation year, VMI e-mail address, VMI box number, home address and phone number, degrees received or anticipated, degree date, honors received, photograph, participation in officially recognized activities and sports, weight and height of members of athletic teams. The Institute may, at its discretion, disclose any of these items without prior written consent. It is the responsibility of the cadet to notify the Director of Communications and Marketing in writing within 7 days of the start of the fall semester if he/she does not want directory information released.

VMI reserves the right to deny requests from external companies using the information for commercial gain.

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. Cadets must successfully complete all ROTC classes in Military Science and Leadership (Army), Naval Science (Navy or Marine Corps) or Aerospace Studies (Air Force) in order to meet graduation requirements. 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. The Virginia Military Institute can make no guarantee of enrollment or of continuance in the ROTC as these matters are controlled by the Federal government. The choice of ROTC program is initially at the option of the individual cadet.

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 country 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, but all are welcome.

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 five-week Leadership Development and Assessment Course (LDAC), known as "Warrior Forge," 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, Air Assault, Northern Warfare, and The Mountain Warfare. 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 program is a four-year course of instruction designed to provide cadets the opportunity to earn regular commissions in either the Navy or the Marine Corps. Cadets who enroll in the Naval Science courses receive instruction leading to possible careers in the air, on land and at sea. Additionally, the classes acquaint cadets with the Marine Corps and all elements of the Marine Air Ground Task Force. Navy-option cadets will subsequently receive instruction in naval ship systems, navigation, ship operations, leadership and management. Marine-option cadets will study the evolution of warfare, leadership and amphibious warfare.

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. 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 and a flight orientation program consisting of flying in a light aircraft operated by the Virginia Civil Air Patrol.

Cadets may apply for career fields of their choice: such as pilot, combat systems officer, space and 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, \$900 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 navigators, the service obligation is ten and six years, respectively, from completion of pilot and navigator 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 Attn: ATCC-PS Fort Monroe, Virginia 23651 1-800-USA-ROTC www.armyrotc.com
Navy/Marine Corps:	Navy & Marine Corps ROTC Program College Scholarship Program Navy Recruiting Command (5057) Code 315 Millington, TN 38054-9901 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 offers 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 at least 17 years of age on or before 30 June of the year of enrollment and be less than 25 years of age on 30 June of the calendar year in which commissioned, 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, College Program Midshipmen 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.

Matriculating freshman with a 3 or 4 year ROTC scholarship, who maintain satisfactory disciplinary standing with the Corps of Cadets and maintain their scholarship requirements will receive a \$1,000 annual scholarship from VMI to help defray the costs of room and board. This scholarship is available for all 4 years if the recipient meets the noted academic and disciplinary guidelines.

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 Basic ROTC Program (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 contracted cadets receive a monthly stipend of \$250 for freshman, \$300 for sophomore, \$350 for junior, \$400 for senior.
- * 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 Leadership Development and Assessment Course (LDAC), known as “Warrior Forge” at Fort Lewis, Washington. 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 LDAC, 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. Once selected, scholarship program cadets must perform training of four to eight weeks during each summer between academic years. The first summer, cadets receive indoctrination in aviation, submarine, amphibious, and surface operations at various military bases throughout the country. The second summer, training is performed aboard operational ships in the fleet at home and abroad. Marine option midshipmen have the opportunity to train with active duty or reserve units in amphibious operations, or mountain warfare. During the third summer, candidates for Navy commissions perform their training with fleet operational ships or aviation squadrons, serving with junior officers. Marine Corps candidates attend Officer Candidates School at Quantico, Virginia. Contracted, non-scholarship cadets (College Program Advanced Standing) are required to perform only the training specified for the third summer.

Air Force. Cadets selected for enrollment into the POC must attend Air Force ROTC Field Training, normally during the summer between their sophomore and junior years. This training, conducted at Maxwell Air Force Base, Ala., 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 police, 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.

CREDIT 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), the Professor of Naval Science (PNS), 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/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)

AIR FORCE

AS 103 & AS 104

AS 203 w/ AS 213 & AS 204 w/ AS 214 (Only Commission seeking cadets take AS 214)

AS 303 w/ AS 313 or *LS 350 & AS 304 w/ AS 314 or LS 351

AS 403 w/ AS 413 or LS 450 & AS 404 w/ AS 414 or LS 451

N/A

2.0 (to contract) 2.5 (to obtain scholarship) 2.5 Term G.P.A. (to maintain scholarship)

ARMY

MS 109 & MS 110

MS 209 & MS 210

MS 309 w/ MS 319 or LS 350 (non-commissioning cadets) & MS 310 w/ MS 320 or LS 351(non-commissioning cadets)

MS 409 w/ MS 419 or MS 319 (LDAC bound cadets) or LS 350 & MS 470 w/ MS 471 (LDAC bound cadets) or LS 451

U.S. Military History

2.0 (to contract) 2.5 (to obtain scholarship) 2.0 (semester and cumulative to commission)

MARINES

NS 101 & NS102

NS 203 & NS206

NS 303 w/ NS 313 or LS 350 & NS 306 w/ NS 316 or LS 351

NS 403 w/NS 413 or LS 450 & NS 402 w/ NS 414 or LS 451

American Military History or National Security Policy (300 level) and Swimming

min 2.5 (to apply for scholarship) min 2.0 (cumulative to commission)

NAVY

NS 101 & NS 102

NS 203 & NS 205 w/NS211

NS 308 & NS 309 w/ NS 315

NS 408 w/NS 411 or LS 450 & NS 402 w/NS 412 or LS 451

2 semesters of Calculus, 2 semesters of Calculus-based Physics, American Military History or National Security Policy (300 level), Swimming

1 semester of foreign culture studies (History, not language)

min 2.5 (to apply for scholarship) min 2.0 (cumulative to commission)

* 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, B.S. Psychology, Chemistry, Computer Science, Physics, Physics with Nuclear Energy Concentration, Civil Engineering, Electrical and Computer Engineering, Mechanical Engineering) and the liberal arts (Economics and Business, English, History, International Studies and Political Science, Modern Languages and Cultures, B.A. Psychology, B.A. Physics).

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.

APPLIED MATHEMATICS CURRICULA

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 mathematics.

Opportunities exist for cadets to participate in summer undergraduate research programs at VMI and/or internships with governmental analytical agencies or in the private sector. Recently cadets have taken internships at Los Alamos National Laboratory, TRADOC Research and Analysis Center, and SAIC.

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.

MATHEMATICS MINOR

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 or CS 221
- MA 108 or MA 220
- MA 123, MA 124, MA 215
- Nine additional semester hours chosen from MA courses numbered 300 and above. Three of these hours may be satisfied by PH301, CS340, HNS377W or MA330WX.

At least a 2.0 GPA must be maintained for courses within the minor field.

To become a candidate for the minor, the cadet must obtain the approval of both the Head of the Department of Mathematics and Computer Science and the head of the department in the major field.

REQUIREMENTS FOR B.S. DEGREE IN APPLIED MATHEMATICS

The B.S. in Applied Mathematics requires 136 semester hours which includes a minimum of 55 hours of mathematics and 3 hours of C Programming. 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.

AREA	REQUIREMENTS
MATHEMATICS	MA 103, MA 108, MA 110, MA 123, MA 124, MA 133, MA 134, MA 215, MA 301, MA 305, MA 311, MA 319, MA 326, MA 432, MA 490W, and 15 semester hours chosen from math courses numbered 300 or above and PH 301.
COMPUTER SCIENCE	CS 340.
SCIENCE	16 semester hours from two different sciences. (Must complete a two course sequence in each field.) All courses must be laboratory courses.
ENGLISH	10 semester hours to include WR 101, WR 102 and SE 300.
NON-MATHEMATICS	12 semester hours to include HI 103, HI 104, and PS 344 and 3 additional hours from any discipline other than Mathematics.
MILITARY SCIENCE	12 semester hours.
PHYSICAL EDUCATION	4 semester hours.
CIVILIZATION & CULTURES	6 semester hours from the VMI list of approved "X" designated courses.

SYNOPSIS OF THE B.S. CURRICULUM IN APPLIED MATHEMATICS

FOURTH (FRESHMAN) CLASS

First Semester

Subject	Semester Hrs. Credit
	#Science .....4
WR 101	English Composition I* .....3
MA 103	Matrix Algebra .....2
MA 123	Calculus I* .....3
MA 133	Math Lab MIPS I .....1
	AS, MS, or NS .....1
TOTAL	14

Second Semester

Subject	Semester Hrs. Credit
	#Science .....4
WR 102	English Composition II* .....3
MA 108	Intro to Prob & Stat .....3
MA 124	Calculus II* .....3
MA 110	Math Software .....2
MA 134	MIPS II .....1
PE 102	Boxing $\frac{1}{2}$
	AS, MS, or NS .....1
TOTAL	17 $\frac{1}{2}$

THIRD (SOPHOMORE) CLASS

First Semester

Subject	Semester Hrs. Credit
HI 103	World History .....3
MA 215	Calculus III .....4
MA 311	Diff Eqns .....3
	Science .....4
	Elective .....3
PE 101	Swimming $\frac{1}{2}$
	AS, MS, or NS .....1
TOTAL	18 $\frac{1}{2}$

Second Semester

Subject	Semester Hrs. Credit
HI 104	World History .....3
MA 301	Math for Sci & Engr .....3
MA 305	Linear Algebra .....3
	Science .....4
PS 344	Leadership in Organizations .....3
PE 211	Wrestling $\frac{1}{2}$
	AS, MS, or NS .....1
TOTAL	17 $\frac{1}{2}$

SECOND (JUNIOR) CLASS

First Semester

Subject	Semester Hrs. Credit
CS 340	C Programming .....3
MA 432	Numerical Analysis .....3
MA 319	Operations Research I .....3
	Civilizations & Cultures Course .....3
	Elective .....3
PE 300	Prin. Physical Cond. ....1
	AS, MS, or NS .....2/1 NS
TOTAL	17-18

Second Semester

Subject	Semester Hrs. Credit
MA 326	Prob & Stat .....3
	Mathematics .....3
	English (EN) OR Writing (WR) Elective .....3
	Civilizations & Cultures Course .....3
	Elective .....3
	Physical Education $\frac{1}{2}$
	AS, MS, or NS .....2
TOTAL	17 $\frac{1}{2}$

FIRST (SENIOR) CLASS

First Semester

Subject	Semester Hrs. Credit
MA 490W	Math Capstone .....3
	Mathematics .....6
	SS, Human, Sci .....3
	Elective .....3
PE 200	Drug and Alcohol Awareness $\frac{1}{2}$
	AS, MS, or NS .....2
TOTAL	17 $\frac{1}{2}$

Second Semester

Subject	Semester Hrs. Credit
	Mathematics .....6
SE 300	Public Speaking .....1
	Elective .....6
	Physical Education $\frac{1}{2}$
	AS, MS, or NS .....2
TOTAL	15 $\frac{1}{2}$

Total Hours: 136 (includes 55 hours of mathematics)

Cadet must choose a science sequence with Lab in biology, chemistry, or physics.

* Minimum Grade of C required

BIOLOGY CURRICULA

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, while providing the opportunity to specialize in the sub-disciplines described under “Academic Concentrations in Biology.” In addition, attainment of teacher certification is possible. The degree programs are particularly good at preparing majors to pursue post-graduate education in the biological and health sciences and allow for specialization that matches student interests and career plans. 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 also provides a summer research experience. The Dr. Fred C. Swope Summer Scholars Program is an intensive, eight-week program that introduces selected students to the scientific method, research design and data analysis, data presentation, use of sophisticated laboratory instruments, and independent research. Each student conducts a research project under the guidance of a faculty mentor. This research is at the “cutting edge” of science, and student/faculty publications have resulted from these projects. Normally, cadets are selected to participate in this program between their second and first class years. Many additional opportunities for undergraduate research exist, allowing students to engage in a one-on-one interaction with a faculty mentor in their area of interest as early as the summer following the fourth class (freshman) year.

B.S. CURRICULUM

Common Core Course Requirements

All B.S. Biology majors are required to complete the following courses:

BI 101 Introductory Biology I
BI 102 Introductory Biology II
BI 103 Principles of Biology and Research I
BI 104 Principles of Biology and Research II
BI 205 Genetics
Capstone Experience (3 credits)

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

BI 312 Ecology or BI 410 Evolution
BI 304 Comparative Vertebrate Morphology or BI 217 Botany
BI 335 Neurobiology or BI 204 Physiology
BI 404 Cell Biology or BI 430 Molecular Biology

Additional hours (10) must be selected from any area within the biology curriculum except for research hours to total 45 hours in biology. In addition to the biology courses, B.S. majors must complete two semesters of Organic Chemistry with lab (CH 223 and 225, CH 224 and 226), CH 322 Biochemistry, Quantitative Analysis I and II (MA 125 and 126), and General Physics I and II (PY 120 and PY 115, PY 121 and PY 116). To broaden the education, six credits of English (EN) or Writing (WR) above the 100 level are required. Additionally, 12 non-science elective credits must be completed in English, history, economics, business, psychology, philosophy, fine arts, political science, or modern languages. The remainder (9) of the 135 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, English, or history, for example, fit in well to our elective requirements.

B.A. CURRICULUM

Common Core Course Requirements

The B.A. curriculum is designed for those majors who require greater flexibility in their degree requirements, including pursuit of minors in other departments. All B.A. Biology majors are required to complete the following courses:

BI 101 Introductory Biology I
BI 102 Introductory Biology II
BI 103 Principles of Biology and Research I
BI 104 Principles of Biology and Research II
BI 205 Genetics
Capstone Experience (3 credits)

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

BI 312 Ecology or BI 410 Evolution
BI 304 Comparative Vertebrate Morphology or BI 217 Botany
BI 335 Neurobiology or BI 204 Physiology
BI 404 Cell Biology or BI 430 Molecular Biology

Additional hours (10) must be selected from any area within the biology curriculum except for research hours to total 45 hours in biology. In addition to the biology courses, B.A. majors must complete Quantitative Analysis I and II (MA 125 and 126) 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 225, CH 224 and 226) or General Physics I and II (PY 120 and PY 115, PY 121 and PY 116). To broaden the education, six credits of English above the 100 level are required. Additionally, 12 non-science elective credits must be completed in either English (EN) or Writing (WR), history, economics, business, psychology, philosophy, fine arts, political science, or modern languages. The remainder (9) of the 135 hours required for graduation can be taken from any department on post. Cadets completing the B.A. degree often complete double majors or 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, English, or history, for example, fit in well to 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. SE 100 – Public Speaking.

ACADEMIC 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 BS or BA degree with recognition of the concentration on the final transcript.

Biochemistry and Molecular Biology (BMB) Concentration Curriculum Requirements and Health Sciences Focus

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 BS/BA in biology or the BS/BA in chemistry degrees. The Concentration requires completion of Introductory Biology I (BI 101), Genetics (BI 205), Cell Biology (BI 404), Structural Biochemistry (CH 321), Molecular Biochemistry (CH 322), Biochemistry Laboratory (CH 323), either Molecular Biology (BI 430) or Physical Chemistry I (CH 301), and two semesters (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 fulfilling the department's Capstone requirement. A 2.0 GPA must be maintained in BMB courses for the concentration. Permission to participate in the program must be obtained from the student's Department Head and the BMB Director. An application form for the BMB concentration can be obtained from the Biology Department secretary, or on line through the BMB website.

Suggested Course Selection for the BMB Concentration

- BI 101 General Biology I (non- BI majors only, BI majors take both sequences)*
- BI 204 Physiology
- BI 205 Genetics)*
- BI 215 Nutrition
- BI 218 Biology of Gender

- BI 240 Biological Agents in Warfare and Terrorism
 - BI 245X Epidemics and Society
 - BI 303 Developmental Biology
 - BI 304 Comparative Vertebrate Morphology
 - BI 313 Microbiology
 - BI 322 Plant Physiology
 - BI 321 Invertebrate Zoology
 - BI 323 Exercise Physiology
 - BI 331WX Issues in Science and Medicine
 - BI 335 Neurobiology
 - BI 404 Cell Biology*
 - BI 405 Histology
 - BI 411 Immunology
 - BI 430 Molecular Biology*
 - CH 262 Public Health Issues
 - CH 321 Structural Biochemistry*
 - CH 322 Molecular Biochemistry*
 - CH 323 Biochemistry Laboratory*
- *Concentration requirement

Ecology, Conservation, and Organismal Sciences (ECOS) Concentration Curriculum Requirements

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 304 Comparative Vertebrate Morphology, BI 311 Aquatic Ecosystems, BI 312 Ecology, BI 316 Mammalogy, BI 317 Herpetology, BI 322 Plant Physiology, BI 324 Ornithology, or BI 410 Evolutionary Biology. Of these 14 required credits, cadets must take at least one taxon specific course (BI 216, BI 217, BI 304, BI 316, BI 317, BI 322, or BI 324), and one concept-based course (BI 311, BI 312, or BI 410). 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 390/391 or BI 490/491), 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 351/352 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
 BI 217 Botany
 BI 304 Comparative Vertebrate Morphology
 BI 316 Mammalogy
 BI 317 Herpetology
 BI 322 Plant Physiology
 BI 324 Ornithology

Concept-Based Courses – of the 14 credits, at least one course must be from the following:

BI 311 Aquatic Ecosystems
 BI 312 Ecology
 BI 410 Evolutionary Biology

Academic Concentration in Teacher Certification**Requirements**

This program is appropriate for those students who are interested in teaching careers in secondary education. The program requires completion of the common core and laboratory course requirements, as well as the additional B.S. or B.A. course requirements. In addition, those students wanting teacher certification will have to satisfy the requirements of the teacher certification program by contacting the Director of Teacher Certification. This program is offered through a consortium agreement with Mary Baldwin College and Washington and Lee University. The teacher program provides cadets with the courses they need to: 1) obtain licensure in the state of Virginia, 2) work toward licensure in another state, or 3) gain credentials for teaching in private secondary schools.

Application Procedure:

Cadets wishing to apply for the program must submit an application to the Director of Teacher Certification, Captain Chad Joyce, 312 Cocks Hall. Cadets who are seriously thinking about pursuing licensure are encouraged to apply as early as the second semester of their fourth class year. Cadets interested in licensure in a state other than Virginia or who wish to teach in private secondary schools must also complete an application to be eligible to enroll in VMI's education courses.

Candidacy Requirement:

Cadets who wish to be admitted to the teacher certification program must meet and maintain a cumulative 2.5 GPA. Those cadets who do not meet the cumulative 2.5 standard by the end of their fourth class year, may be admitted conditionally by the Director of Teacher Certification; they must, however, achieve a 2.5 cumulative GPA by the end of the first semester of their second class year in order to continue in the program. Those cadets pursuing licensure in Virginia must also meet the following:

1. Graduation from VMI in an appropriate major discipline.
2. Successful completion of all teacher-certification courses with a 3.0 GPA.
3. Completion of 12 semester hours of student teaching. This requires full-time teaching for one semester under the supervision of a master teacher in the public schools. Because of the demands of most VMI majors, this requirement may need to be completed after graduation from VMI through the adult degree program at Mary Baldwin College.
4. Successful completion of the State Licensure Examination.

Course Requirements

The following courses are required for licensure in Virginia. Those cadets who are pursuing licensure in another state or who wish to teach in private schools should consult with the Director of Teacher Certification to design a program that includes appropriate courses from the listing below.

ED 200 Foundations of Education	3
ED 210 Practicum in Education	3
ED 302 Understanding Exceptional Individuals.....	3
ED 303 Teaching and Learning in the Content Areas	3
ED 401 Secondary Methods and Practicum	4
ED 402 Student Teaching and Seminar	15
PS 307 Developmental Psychology.....	3

CAPSTONE EXPERIENCES IN UNDERGRADUATE RESEARCH REQUIREMENT (3 CREDITS)

Recognizing that many of our students already engage in a comprehensive research experience that requires them to apply, integrate, and critically analyze information and data, the biology department requires that this experience be recognized as their Capstone Experience. Successful completion of the Capstone Experience is a graduation requirement, therefore any of the following course sequences will satisfy that requirement: BI 353W-354W Summer Scholars Program, BI 390, 391, 392W, 393W, 490W, and 491W Independent Research Courses, BI 401W-402W Senior Honors Thesis, and HN 400-401 Institute Honors. Students must complete two semesters or a full summer of research (SURI) under the guidance of a faculty mentor culminating with a research paper and oral presentation of the data. Those biology students who do not avail themselves of the opportunity to engage in undergraduate research or do so for only one semester will be required to complete BI 420W, Senior Seminar, in order to fulfill the capstone course requirement. Those receiving more than 3 credits for this experience can apply them as research hours credit.

**DR. FRED C. SWOPE
SUMMER SCHOLARS PROGRAM**

The Fred C. Swope Summer Undergraduate Research Scholar's 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, Dr. Fred C. Swope. This

two-month program is designed to acquaint selected Biology undergraduate students with the philosophy, practices, and techniques of research. During the months of June through July the program engages the students in a research project with a faculty mentor. At the end of the summer students in the program organize a symposium that is presented to reflect the many facets of their undergraduate research training. Students in the program spend their mornings learning about the many skills and philosophies of the practice of science. Students also carry out research projects in the afternoons with a faculty mentor and acquire the ability to make scientific observations, collect and analyze data, and to synthesize this information in a meaningful context. 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. The program is funded through a private endowment that provides funds for 5-6 student summer stipends plus room, board, six hours of academic credit, and spending money.

INSTITUTE HONORS

The Institute Honors Program is open to cadets of all majors who seek ways to broaden and deepen their academic experience at VMI. Honors cadets explore current events in a weekly honors forum, probe complex issues in honors seminars, and join with a faculty mentor in a sustained undergraduate research experience culminating in a senior thesis. Along the way, they enjoy special meetings with such distinguished visitors as Holocaust survivor Elie Wiesel, journalist Thomas Friedman, physicist Brian Greene, and artist William Christenberry, and they are treated to a variety of other special events designed to challenge and inspire them. Active student chapters of academic and professional societies are sponsored by VMI's academic departments.

HONORS IN BIOLOGY

A cadet can earn departmental honors by completing a research project by their 1st class year and presenting the research to the department. Eligibility to apply for departmental honors requires 1st class standing, 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 (independent research in the fall) and then BI 491 (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.

SYNOPSIS OF THE B.S. CURRICULUM IN BIOLOGY

FOURTH (FRESHMAN) CLASS

First Semester

	Subject	Semester Hrs. Credit
BI 101	Introductory Biology I.....	4
WR 101	English Composition I*.....	3
HI 103	World History.....	3
BI 103	Prin. of Biological Research I.....	2
MA 125	Quantitative Analysis I*.....	3
	AS, MS, or NS.....	1
TOTAL	.....	16

Second Semester

	Subject	Semester Hrs. Credit
BI 102	Introductory Biology II.....	4
WR 102	English Composition II*.....	3
HI 104	World History.....	3
BI 104	Prin. of Biological Research II.....	2
MA 126	Quantitative Analysis II.....	3
PE 101/102	Swimming or Boxing.....	1/2
	AS, MS, or NS.....	1
TOTAL	.....	16 1/2

THIRD (SOPHOMORE) CLASS

First Semester

	Subject	Semester Hrs. Credit
BI 205	Genetics or Core Area Elective.....	4
BI	Core Area Elective.....	3 or 4
CH 117	Lab for CH 137.....	1
CH 137	Intro. College Chemistry I.....	3
	English (EN) or Writing (WR) Elective.....	3
	LA Elective.....	3
PE 101/102	Swimming or Boxing.....	1/2
	AS, MS, or NS.....	1
TOTAL	.....	18 1/2 -19 1/2

Second Semester

	Subject	Semester Hrs. Credit
BI	Core Area Elective.....	3 or 4
CH 118	Lab for CH 138.....	1
CH 138	Intro. College Chemistry II.....	3
	Elective.....	3
	English (EN) or Writing (WR) Elective.....	3
SE 300	Public Speaking.....	1
PE 211/300	Wrestling or Prin. Of Physical Cond.....	1/2 -1
	AS, MS, or NS.....	1/2 NS
TOTAL	.....	15 1/2 -18

SECOND (JUNIOR) CLASS

First Semester

	Subject	Semester Hrs. Credit
BI	Genetics or Core Area Elective.....	3 or 4
CH 223	Organic Chemistry I*.....	3
CH 225	Organic Lab I.....	1 1/2
PY 120	General Physics I.....	3
PY 115	General Physics I Lab.....	1
PS 344	Leadership in Organizations.....	3
PE 211/300	Wrestling or Prin. Of Physical Cond.....	1/2 -1
	AS, MS, or NS.....	2/1NS
TOTAL	.....	16-18 1/2

Second Semester

	Subject	Semester Hrs. Credit
BI	Elective.....	4
CH 224	Organic Chemistry II.....	3
CH 230	Organic Lab II.....	1 1/2
PY 121	General Physics II.....	3
PY 116	General Physics II Lab.....	1
	LA Elective.....	3
PE 200	Drug and Alcohol Awareness or Elective ..	1/2
	AS, MS, or NS.....	2
TOTAL	.....	18

FIRST (SENIOR) CLASS

First Semester

	Subject	Semester Hrs. Credit
BI	Core Area Elective.....	3 or 4
	BI Elective.....	3
	LA Elective.....	6
	Electives.....	3
	Physical Education.....	1/2
	AS, MS, or NS.....	2
TOTAL	.....	17 1/2 -18 1/2

Second Semester

	Subject	Semester Hrs. Credit
BI 420	Biology Seminar.....	3
	BI Elective.....	3
	Elective.....	3
CH 322	Biochemistry.....	3
	Physical Education.....	1/2
	AS, MS, or NS.....	2
TOTAL	.....	14 1/2

BI (B.S.) (136-138 Hrs. Reg.- 43 BI hours)

*Minimum Grade of C Required.

SYNOPSIS OF THE B.A. CURRICULUM IN BIOLOGY

FOURTH (FRESHMAN) CLASS

First Semester

	Subject	Semester Hrs. Credit
BI 101	Introductory Biology I.....	4
BI 103	Prin. of Biological Research I.....	2
MA 125	Quantitative Analysis I*.....	3
WR 101	English Composition I *.....	3
HI 103	World History.....	3
	AS, MS, or NS.....	1
TOTAL		16

Second Semester

	Subject	Semester Hrs. Credit
BI 102	Introductory Biology II.....	4
BI 104	Prin. of Biological Research II.....	2
MA 126	Quantitative Analysis II.....	3
WR 102	English Composition II *.....	3
HI 104	World History.....	3
PE 101/102	Swimming or Boxing.....	1/2
	AS, MS, or NS.....	1
TOTAL		16 1/2

THIRD (SOPHOMORE) CLASS

First Semester

	Subject	Semester Hrs. Credit
BI 205	Genetics or Core Area Elective.....	3 or 4
	English (EN) or Writing (WR) Elective.....	3
	Elective.....	3
	Language.....	3
CH 137	Intro. College Chemistry I.....	3
CH 117	Lab for CH 137.....	1
PE 101/102	Swimming or Boxing.....	1/2
	AS, MS, or NS.....	1
TOTAL		17 1/2 - 18 1/2

Second Semester

	Subject	Semester Hrs. Credit
BI	Core Area Elective.....	3 or 4
	English (EN) or Writing (WR) Elective.....	3
	Language.....	3
CH 138	Intro. College Chemistry II.....	3
CH 118	Lab for CH 138.....	1
SE 300	Public Speaking.....	1
PE 211/300	Wrestling or Princ. Of Physical Cond.....	1/2 - 1
	AS, MS, or NS.....	1/2 NS
TOTAL		15 1/2 - 18

SECOND (JUNIOR) CLASS

First Semester

	Subject	Semester Hrs. Credit
BI	Genetics or Core Area Elective.....	3 or 4
CH 223	Organic Chemistry I *AND.....	3
CH 225	Organic Lab, OR.....	1 1/2
PY 120	General Physics I.....	3
PY 115	General Physics I Lab.....	1
PS 344	Leadership in Organizations.....	3
	Language.....	3
PE 211/300	Wrestling or Prin. Physical Cond.....	1/2 - 1
	AS, MS, or NS.....	2/1 NS
TOTAL		14 1/2 - 17 1/2

Second Semester

	Subject	Semester Hrs. Credit
	BI Elective.....	4
CH 224	Organic Chemistry II* AND.....	3
CH 236	Organic Lab II, OR.....	1 1/2
PY 121	General Physics II.....	3
PY 116	General Physics II Lab.....	1
	LA Elective.....	3
	Language.....	3
PE 200	Drug and Alcohol Awareness.....	1/2
	AS, MS, or NS.....	2
TOTAL		16 1/2 - 17

FIRST (SENIOR) CLASS

First Semester

	Subject	Semester Hrs. Credit
	BI Elective.....	6
BI	Core Area Elective.....	3 or 4
	LA Elective.....	6
	PE Elective.....	1/2
	AS, MS, or NS.....	2
TOTAL		17 1/2 - 18 1/2

Second Semester

	Semester Subject	Hrs. Credit
BI	Core Area Elective.....	3 or 4
BI 420	Biology Seminar.....	3
	Elective.....	6
	LA Elective.....	4
	PE Elective.....	1/2
	AS, MS, or NS.....	2
TOTAL		18 1/2 - 19 1/2

BI (B.A.) (136-138.5 Hours Reg. - 43 BI Hours)

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

*Minimum Grade of C Required.

Proficiency through 200 level language is required.

CHEMISTRY CURRICULA

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.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, Science and 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 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. Majors 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, instrumentation, library and computer services housed in the Science Building 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; nuclear magnetic resonance spectrometers, gas chromatography-mass spectrometer, along with an atomic absorption, d.c. plasma, and flame emission

spectrometers. The department also maintains a computer facility for molecular modeling and chemistry tutorials.

All chemistry majors are encouraged to join the active Student Affiliate Chapter of the American Chemical Society. The chapter sponsors visiting speakers, trips to industrial and government laboratories and several social events during the year.

CHEMISTRY PROGRAMS

1. **B.S. Curriculum** — synopsis indicates requirements for this degree.
2. **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, (2) a Concentration in Biochemistry and Molecular Biology or (3) Teacher Certification. Among the more popular focus areas are the Concentration in Biochemistry and Molecular Biology and the Minor in Business.
3. **A Minor in Chemistry** — The Department of Chemistry offers a minor in chemistry to those cadets wishing to expand their scientific knowledge beyond their declared major. Requirements for the minor consist of eight semester hours of core General Chemistry, three hours of Organic Chemistry I (CH 223) with the lab being optional and twelve additional hours of chemistry courses as described in a brochure on the subject which can be obtained from the Chemistry Department. Before formally registering for the program, a cadet should obtain the approval of the department in the major curriculum as well as the head of the Chemistry Department. Successful completion of the requirements of this minor will be noted on the cadet's transcript.
4. **Concentration in Biochemistry and Molecular Biology** — The Chemistry Department in collaboration with the Biology Department offers its majors the option of obtaining a concentration in the interdisciplinary area of biochemistry and molecular biology. This concentration is particularly well-suited for those chemistry majors wishing to pursue careers in medicine, pharmaceuticals, biomedical research or biochemistry. Pursuit of this concentration does not change the graduation requirements for chemistry majors. Through the choice of appropriate electives and advanced courses, both B.S. and B.A. chemistry majors can obtain this concentration without increasing the number of credit hours required to graduate. To obtain the Concentration in Biochemistry and Molecular Biology, chemistry majors must take the following: BI-101 (Introductory Biology I), BI-205 (Genetics), and BI-302 (Cell Biology). In addition, they must choose CH-322 (Metabolic Biochemistry) and CH-323 (Biochemistry Laboratory) as part of their advanced chemistry electives, and 4 credits of research experience in chemistry or biology. The research experience can be obtained through thesis research, independent research, summer research or a combination thereof.

SYNOPSIS OF THE B.A. CURRICULUM IN CHEMISTRY

FOURTH (FRESHMAN) CLASS

First Semester

	Subject	Semester Hrs. Credit
CH 125	Lab for CH 137	2
CH 137	Intro. College Chemistry I	3
MA 123	Calculus I*	3
HI 103	World History	3
WR 101	English Composition I*	3
	AS, MS, or NS	1
TOTAL	.....	15

Second Semester

	Subject	Semester Hrs. Credit
CH 126	Lab for CH 138	2
CH 138	Introductory Chemistry II	3
MA 124	Calculus II	3
HI 104	World History	3
WR 102	English Composition II*	3
PE 102	Boxing	1/2
	AS, MS, or NS	1
TOTAL	.....	15 1/2

THIRD (SOPHOMORE) CLASS

First Semester

	Subject	Semester Hrs. Credit
CH 223	Organic Chemistry I*	3
CH 225	Organic Lab I	3
	Foreign Language ¹	3
	Science Elective ²	4
	Concentration Elective ³	3
PE 200	D&A Awareness	1/2
	AS, MS, or NS	1
TOTAL	.....	17 1/2

Second Semester

	Subject	Semester Hrs. Credit
CH 224	Organic Chemistry II	3
CH 225	Organic Lab II	3
PS 344	Leadership in Organizations ¹	3
	Foreign Language ¹	3
	Science Elective ²	4
PE 211	Wrestling	1/2
	AS, MS, or NS	1
TOTAL	.....	17 1/2

SECOND (JUNIOR) CLASS

First Semester

	Subject	Semester Hrs. Credit
CH 301	Physical Chemistry I	3
CH 311W	Lab for CH 301	3
CH 321	Biochemistry	3
	Foreign language ¹	3
	Concentration Elective ³	3
PE 300	Prin. Physical Conditioning	1
	AS, MS, or NS	2
TOTAL	.....	18

Second Semester

	Subject	Semester Hrs. Credit
	Adv CH course (300 or above)	3
	Foreign Language ¹	3
	Concentration Elective ³	3
CH 246	Inorganic Chemistry	3
	Cult. And Civil Elective ¹	3
PE 101	Swimming	1/2
	AS, MS, or NS	2
TOTAL	.....	17 1/2

FIRST (SENIOR) CLASS

First Semester

	Subject	Semester Hrs. Credit
CH 335	Analytical Chemistry I	3
CH 337	Lab for Analytical Chem. I	3
	Cult. And Civil Elective ¹	3
	Concentration Elective ³	3
CH 401	CH Capstone	3
	Physical Education	1/2
	AS, MS, or NS	2
TOTAL	.....	17 1/2

Second Semester

	Subject	Semester Hrs. Credit
	Concentration Elective ³	3
SE 300	Public Speaking	1
	Electives	10
	Physical Education	1/2
	AS, MS, or NS	2
TOTAL	.....	16 1/2

Total Hours: 135 (includes at least 43 chemistry hours)

* 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.

SYNOPSIS OF THE B.S. CURRICULUM IN CHEMISTRY

FOURTH (FRESHMAN) CLASS

First Semester

	Subject	Semester Hrs. Credit
CH 125	Lab for CH 137.....	2
CH 137	Intro Chemistry I.....	3
MA 123	Calculus I*.....	3
HI 103	World History.....	3
WR 101	English Composition I*.....	3
	AS, MS, or NS.....	1
TOTAL		15

Second Semester

	Subject	Semester Hrs. Credit
CH 126	Lab for CH 138.....	2
CH 138	Intro Chemistry II.....	3
MA 124	Calculus II*.....	3
HI 104	World History.....	3
WR 102	English Composition II*.....	3
PE 102	Boxing.....	1/2
	AS, MS, or NS.....	1
TOTAL		15 1/2

THIRD (SOPHOMORE) CLASS

First Semester

	Subject	Semester Hrs. Credit
CH 223	Organic Chemistry I.....	3
CH 225	Organic Lab I.....	1 1/2
MA 215	Calculus III.....	4
PY 160	General Physics I (with PY 155).....	4
	Elective ¹	3
PE 200	D & A Awareness.....	1/2
	AS, MS, or NS.....	1
TOTAL		17

Second Semester

	Subject	Semester Hrs. Credit
CH 224	Organic Chemistry II.....	3
CH 225	Organic Lab II.....	3
CH 246	Inorganic Chemistry.....	3
PY 161	General Physics II (with PY 156).....	4
PS 344	Leadership in Organizations.....	3
SE 300	Public Speaking.....	1
PE 211	Wrestling.....	1/2
	AS, MS, or NS.....	1/2
TOTAL		17-18

SECOND (JUNIOR) CLASS

First Semester

	Subject	Semester Hrs. Credit
CH 301	Physical Chemistry I.....	3
CH 311W	Lab for CH 301.....	3
CH 335	Analytical Chemistry I.....	3
CH 337	Lab for Analytical Ch I.....	1 1/2
CH 321	Structural Biochemistry.....	3
	Elective ¹	3
PE 300	Prin. Physical Cond.....	1
	AS, MS, or NS.....	2/1
TOTAL		18-17

Second Semester

	Subject	Semester Hrs. Credit
CH 302	Physical Chemistry II.....	3
CH 336	Instrumental Analysis.....	3
CH 338	Lab for Instrumental Analysis.....	1 1/2
	Elective.....	3
	Adv CH Laboratory ²	2
	Cultures and Civil Elective ¹	3
PE 101	Swimming.....	1/2
	AS, MS, or NS.....	2
TOTAL		18

FIRST (SENIOR) CLASS

First Semester

	Subject	Semester Hrs. Credit
	Adv. CH Laboratory ²	2
	Cultures and Civilizations.....	3
CH 401	CH Capstone.....	3
	Electives ¹	7
	Physical Education.....	1/2
	AS, MS, or NS.....	2
TOTAL		17 1/2

Second Semester

	Subject	Semester Hrs. Credit
	Adv. CH Course ³	3
	Adv. CH Laboratory ²	1
	Electives ¹	9
	Physical Education.....	1/2
	AS, MS, or NS.....	2
TOTAL		17 1/2

Total Hours: 135.5 (includes at least 54.5 chemistry hours depending on options selected)

* 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 Students must complete three semester hours of advanced chemistry courses from CH322, CH425, CH 426, CH444, CH467, CH462-4.

⁴ Concentration Electives are determined by the chosen minor/concentration/certification. The chosen field may require additional free electives to complete.

CIVIL ENGINEERING CURRICULUM

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 sub-disciplines 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 on page 45. 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 CE curriculum, which is approved by the Accreditation Board for Engineering and Technology (ABET), 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 13 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:

1. able to analyze and design CE components and systems;
2. committed to life-long learning;
3. able to communicate effectively both in written and oral forms;
4. able to work well in team situations and contribute to the success of an organization; and
5. committed to moral and ethical practices.

The CEE program's 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:

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, and sustainability;
4. an ability to function on multi-disciplinary 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. a broad education necessary to understand the impact of engineering solutions in a 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.

MINIMUM COMPETENCY

All VMI academic departments require a minimum 2.0 GPA in the major as a requirement for graduation. To demonstrate minimum competency in CE, the CEE Department applies the following criteria to compute the 2.0 GPA in the major: 1) any CEE course can be repeated a single time and the repeat grade will be used in the GPA calculation; 2) a maximum of two "D" grades in CEE can be applied toward graduation and included in the GPA calculation.

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. An FE exam review class is required in the seventh semester in anticipation of the exam in October. Cadets are required to repeat the course during the eighth semester if they fail the October exam, and are then required to retake the exam in April. 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.

CEE HONORS PROGRAM

Cadets with a minimum cumulative GPA of 3.00, and a minimum CE GPA of 3.30 may apply to the CEE Honors Program at the beginning of their second class year. Program requirement may be found at the CEE website at: <http://www.vmi.edu/CEEN>.

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.

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.

SUGGESTED COURSE SELECTION FOR CIVIL ENGINEERING SUBDISCIPLINE CONCENTRATIONS

Construction Management

CE302 Dynamics (ESE I)
 CE350 Project Management (required)
 CE403 Foundations (DE)
 CE436 Transportation Planning & Design (DE)
 CE437 Construction Methods & Management (TE)
 GE306 Engineering Geology (NSE)
 1 open Engineering Science Elective II
 3 open Technical Electives or Independent Research

Environmental Engineering

BI101 Biology (NSE)
 CE321 Environmental Engineering (required)
 CE406 Contaminant Hydrogeology (ESE II)
 CE408 Hydraulic Engineering (DE)
 CE412 Env. Engrg. Chemistry (ESE I)
 CE415 Env. Engrg. Unit Process Design (DE)
 4 open Technical Electives or Independent Research

Fluid Mechanics & Hydraulic Engineering

CE302 Dynamics (ESE I)
 CE309 Fluid Mechanics (required)
 CE401 Hydrology (TE)
 CE404 Advanced Fluid Mechanics (ESE II)
 CE408 Hydraulic Engineering (DE)
 1 open Natural Science Elective
 1 open Design Elective
 3 open Technical Electives or Independent Research

Geotechnical Engineering

CE302 Dynamics (ESE I)
 CE310 Soil Mechanics (required)
 CE403 Foundations (DE)
 CE406 Contaminant Hydrogeology (ESE II)
 CE428 Topics in Structural Design (DE)
 GE306 Engineering Geology (NSE)
 4 open Technical Electives or Independent Research

Hydrology & Water Resources Engineering

BI101 Biology (NSE)
 CE322 Water Resources Engineering (required)
 CE401 Hydrology (TE)
 CE406 Contaminant Hydrogeology (ESE II)
 CE408 Hydraulic Engineering (DE)
 CE412 Env. Engrg. Chemistry (ESE I)
 CE415 Env. Engrg. Unit Process Design (DE)
 3 open Technical Electives or Independent Research

Structural Engineering

CE302 Dynamics (ESE I)
 CE327 Concrete Design (required)
 CE402 Structural Mechanics (ESE II)
 CE423 Structural Steel Design (DE)
 CE428 Topics in Structural Design (DE)
 CE429 Advanced Structural Theory (TE)
 GE306 Engineering Geology (NSE)
 3 open Technical Electives or Independent Research

Transportation & Planning Engineering

CE302 Dynamics (ESE I)
 CE333 Transportation Engineering (required)
 CE401 Hydrology (ESE II)
 CE436 Transportation Planning & Design (DE)
 CE437 Construction Methods & Management (TE)
 GE306 Engineering Geology (NSE)
 1 Design Elective
 3 open Technical Electives or Independent Research

DE = Design Elective

TE = Technical Elective

ESE = Engineering Science Elective (I, II)

NSE = Natural Science Elective

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

- 6 credits of Design Elective from CE403, CE408, CE415, CE423, CE428, CE436
- 4 credits of Natural Science Elective from GE306 or BI 101
- 3 credits of Engineering Science Elective I from CE302, CE412, ME311, EE351
- 3 credits of Engineering Science Elective II from CE401, CE402, CE404, CE406, CE429, other EE and ME 300 or 400 level courses
- 12 credits of other technical electives from above or CE437, CE443, CE455-460, CE461

SYNOPSIS OF THE B.S. CURRICULUM IN CIVIL ENGINEERING

FOURTH (FRESHMAN) CLASS

First Semester

	Subject	Semester Hrs. Credit
CE 105	Intro. To Civil Engr.....	1
CE 121	Surveying with Lab	3
CE 104	CE Drawing	1
WR 101	English Composition*.....	3
HI 103	World History I	3
MA 123	Calculus I*	3
	AS, MS, or NS.....	1
TOTAL	.....	15

Second Semester

	Subject	Semester Hrs. Credit
CE 123	Engineering Calculation Tools.....	2
CH 137	Chemistry.....	3
CH 117	Chemistry Lab.....	1
WR 102	English Composition II*.....	3
HI 104	World History II	3
MA 124	Calculus II*	3
	PE	1/2
	AS, MS, or NS.....	1
TOTAL	.....	16 1/2

THIRD (SOPHOMORE) CLASS

First Semester

	Subject	Semester Hrs. Credit
	Natural Science Elec. (GE 306/BI 101)	4
MA 215	Calculus III	4
ME 201	Statics	3
PY 160	Physics I.....	3
PY 155	Physics I Lab.....	1
SE 300	Public Speaking.....	1
	PE	1/2
	AS, MS, or NS.....	1
TOTAL	.....	17 1/2

Second Semester

	Subject	Semester Hrs. Credit
CE 214	CE Methods/Probability/Statistics.....	3
CE 206	Solids	3
MA 311	Differential Equations.....	3
PS 344	Leadership in Organizations	3
PY 161	Physics II.....	3
PY 151	Physics II Lab.....	1
	PE	1/2
	AS, MS, or NS.....	1
TOTAL	.....	17 1/2

SECOND (JUNIOR) CLASS

First Semester

	Subject	Semester Hrs. Credit
CE 301	Structural Theory	3
CE 309	Fluid Mechanics.....	3
CE 310	Soil Mechanics.....	4
CE 321	Environmental Engr. I	3
	Engineering Science Elective I **	3
PE 300	Prin. Physical Cond.	1
	AS, MS, or NS.....	2
TOTAL	.....	19

Second Semester

	Subject	Semester Hrs. Credit
CE 307	Engr. Materials	3
CE 322	Water Resources Engr.	4
CE 327	Concrete Design	3
CE 333	Transportation I.....	3
CE 350	Civil Engr. Project Management.....	3
PE 200	Drug and Alcohol Awareness.....	1/2
	AS, MS, or NS.....	2
TOTAL	.....	18 1/2

FIRST (SENIOR) CLASS

First Semester

	Subject	Semester Hrs. Credit
CE 451	Seminar.....	1
	Design Elective	3
	Engineering Science Elective II.....	3
	Technical Elective	3
	Technical Elective	3
	Civilization & Cultures Elective.....	3
	PE	1/2
	AS, MS, or NS.....	2
TOTAL	.....	18 1/2

Second Semester

	Subject	Semester Hrs. Credit
CE 448	Civil Engr. Design (Capstone)	3
	Design Elective	3
	Technical Elective	3
	Technical Elective	3
	Civilization & Cultures Elective.....	3
	PE	1/2
	AS, MS, or NS.....	2
TOTAL	.....	17 1/2

Total Hours: 139 (includes at least 64 hours of civil engineering)

* Minimum Grade of C Required
**CE 412, CE 302, ME 311 or EE 351

COMPUTER SCIENCE CURRICULUM

The Department of Mathematics and Computer Science offers a computer science major leading to a B.S. degree in computer science.

The aims of the department in training computer science majors are:

- (1) To prepare the student for graduate study in computer science, or for positions in business, industry, and government service which require computing skills and knowledge.
- (2) To give students a firm grounding in the principles and theory underlying computing, oral and written communication skills, and teamwork skills, so that they will understand the capabilities and potentials of hardware and software, the relevance of theory, and the importance of algorithms, information organization, and an awareness of social and ethical issues in computing.

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

COMPUTER SCIENCE MINOR

A minor in computer science is offered to cadets who desire to complement their major area of study with work in computer science. The following courses are required for the minor: either

CS 121-122 or CS 340-422, and nine additional hours of 300- or 400-level CS courses, plus either MA 103, MA 118, or CS 221, and either MA 115, MA 122, MA 123, or MA 126. A minimum 2.0 GPA must be maintained in both the computer science and mathematics courses for the minor. To become a candidate for the minor, the cadet must obtain the approval of the head of the Department of Mathematics and Computer Science and the approval of the head of the department of his/her major field.

REQUIREMENTS FOR B.S. IN COMPUTER SCIENCE

The degree in computer science requires 135 semester hours which includes a minimum of 43 hours of computer science. A minimum 2.0 GPA must be maintained in the computer science courses. The following outline gives minimum requirements. Additional courses to complete the requirements must be chosen by the cadet with approval of his/her departmental adviser. No single course may be used to satisfy requirements in two areas.

Area	Requirements
Computer Science	CS 121, CS 122, CS 316, CS 326, CS 327, CS 345, CS 348, CS 411, CS 412, CS 418, CS 490W, and nine semester hours chosen from CS courses numbered 300 or above.
Humanities/Social Sciences	WR 101, WR 102, HI 103, HI 104, PS 344, SE 300 plus six hours from courses designated as civilizations and cultures.
Mathematics	MA 103, MA 123, MA 124, MA 220, and CS 221.
Science	BI 101& BI 102, or PY 160 - PY 155 & PY 161 - PY 156.
Mathematics and Science Electives	At least 8 semester hours chosen from MA 215, MA 305, MA 306, MA 311, MA 319, MA 422, MA 432, MA 433, BI 101, BI 102, BI 204, BI 205, BI 216, BI 217, BI 303, BI 304, BI 312, BI 313, BI 318, BI 321, BI 324, BI 404, BI 405, BI 410, BI 411, CH 117, CH 118, CH 125, CH 126, CH 137, CH 138, CH 223, CH 224, CH 225, CH 226, CH 246, CH 301, CH 302, CH 311, CH 312, CH 321, CH 322, CH 323, CH 335, CH 336, CH 337, CH 338, CH 425, CH 426, CH 427, CH 434, CH 444, PY 108, PY 203, PY 160, PY 161, PY 155, PY 156, PY 253, PY 254, PY 308, PY 333, PY 334, PY 335, PY 336, PY 341, PY 342, PY 344, PY 441, PY 446, PY 459, AT 201, AT 204, AT 301, AT 306, PS 203, PS 204, PS 301, PS 307, and PS 401. At least one semester hour must be from a mathematics (MA) course.

SYNOPSIS OF THE B.S. CURRICULUM IN COMPUTER SCIENCE

FOURTH (FRESHMAN) CLASS

First Semester

	Subject	Semester Hrs. Credit
CS 121	Programming 1.....	3
WR 101	English Composition I*.....	3
MA 123	Calc. with An. Geom. I*.....	3
	Science#.....	4
	AS, MS, or NS.....	1
TOTAL		14

Second Semester

	Subject	Semester Hrs. Credit
CS 122	Programming II.....	3
CS 221	Discrete Mathematics.....	3
WR 102	English Composition II*.....	3
MA 124	Calc. with An. Geom. II.....	3
	# Science.....	4
PE 102	Boxing.....	1/2
	AS, MS, or NS.....	1
TOTAL		17 1/2

THIRD (SOPHOMORE) CLASS

First Semester

	Subject	Semester Hrs. Credit
CS 316	Computer Systems.....	3
CS 326	Data Structures.....	3
HI 103	World History.....	3
	MA/Sci Elective.....	4
	Elective.....	3
PE 101	Swimming.....	1/2
	AS, MS, or NS.....	1
TOTAL		17 1/2

Second Semester

	Subject	Semester Hrs. Credit
CS 327	Network Computing.....	4
HI 104	World History.....	3
MA 103	Matrix Algebra.....	2
	Civilization & Cultures.....	3
	Elective.....	3
PE 211	Wrestling.....	1/2
	AS, MS, or NS.....	1
TOTAL		16 1/2

SECOND (JUNIOR) CLASS

First Semester

	Subject	Semester Hrs. Credit
CS 348	Database and Information Retrieval.....	3
	CS elective.....	3
MA 220	Probability and Statistics.....	3
SE 300	Public Speaking.....	1
	Elective.....	3
PE 300	Prin. of Physical Conditioning.....	1
	AS, MS, or NS.....	2
TOTAL		16

Second Semester

	Subject	Semester Hrs. Credit
CS 411	Algorithms.....	3
	CS Elective.....	3
PS 344	Leadership in Organizations.....	3
	Electives.....	6
	Physical Education.....	1/2
	AS, MS, or NS.....	2
TOTAL		17 1/2

FIRST (SENIOR) CLASS

First Semester

	Subject	Semester Hrs. Credit
CS 345	Software Engineering.....	3
CS 418	Theory Prog. Lang.....	3
CS 490W	Research Practicum.....	3
	Elective.....	6
PE 200	Drug and Alcohol Awareness.....	1/2
	AS, MS, or NS.....	2
TOTAL		17 1/2

Second Semester

	Subject	Semester Hrs. Credit
CS 412	Intro. To Operating Systems.....	3
	CS Elective.....	3
	MA/Sci Elective.....	4
	Civilization & Cultures.....	3
	Elective.....	3
	PE Elective.....	1/2
	AS, MS, or NS.....	2
TOTAL		18 1/2

Total Hours: 135 (includes 42 hours of computer science)

*Minimum Grade of "C" required

#Cadet must choose a science sequence with Lab in biology or physics.

ECONOMICS AND BUSINESS CURRICULUM

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 liberal arts 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 Sigma Beta Delta (the international honor society in business) and the Cadet Investment Group that affords actual experience in securities investments.

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. Applications for this scholarship will be accepted during the spring semester for awards to be made the following academic year.

THE ECONOMICS MINOR

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.

THE BUSINESS MINOR

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.

THE CONCENTRATION IN FINANCIAL MANAGEMENT

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. They must also complete BU 411, BU 415, EC 405, and one of the following courses: BU 305, BU 412, BU 413, EC 421, or EC 430.

*Competency in statistics can be demonstrated by receiving a "C" or higher in MA 105 and MA 106 or MA 220 or MA 307 or BI 201 in lieu of EC 303.

SYNOPSIS OF THE B.A. CURRICULUM IN ECONOMICS AND BUSINESS

FOURTH (FRESHMAN) CLASS

First Semester

	Subject	Semester Hrs. Credit
	*Biology or Chemistry (with Lab).....	4
WR 101	English Composition I*.....	3
HI 103	World History.....	3
MA 125	Quantitative Methods I*.....	3
	Foreign Language.....	3
	AS, MS, or NS.....	1
TOTAL		17

Second Semester

	Subject	Semester Hrs. Credit
	*Biology or Chemistry (with Lab).....	4
WR 102	English Composition II*.....	3
HI 104	World History.....	3
MA 126	Quantitative Methods II*.....	3
	Foreign Language.....	3
PE 102	Boxing.....	1/2
	AS, MS, or NS.....	1
TOTAL		17 1/2

*Physics may be taken in the 3rd class year: MA 123-124 must be substituted for MA 125-126. See faculty advisor

THIRD (SOPHOMORE) CLASS

First Semester

	Subject	Semester Hrs. Credit
EC 201	Principles of Microeconomics*.....	3
BU 210	Financial Accounting*.....	3
BU 220	Principles of Management*.....	3
	EN/FA/WR Elective.....	3
	Foreign Language.....	3
PE 101	Swimming.....	1/2
	AS, MS, or NS.....	1
TOTAL		16 1/2

Second Semester

	Subject	Semester Hrs. Credit
EC 202	Principles of Macroeconomics*.....	3
BU 211	Managerial Accounting*.....	3
BU 230	Principles of Marketing*.....	3
PS 344	Leadership in Organizations.....	3
	Foreign Language.....	3
SE 300	Public Speaking.....	1
PE 211	Wrestling.....	1/2
	AS, MS, or NS.....	1
TOTAL		17 1/2

SECOND (JUNIOR) CLASS

First Semester

	Subject	Semester Hrs. Credit
EC 300	Intermediate Microeconomics*.....	3
EC 303	Statistics*.....	3
BU 310	Business Finance*.....	3
	Free Elective.....	3
	HI Elective.....	3
PE 300	Prin. of Physical Conditioning.....	1
	AS, MS, or NS.....	2
TOTAL		18

Second Semester

	Subject	Semester Hrs. Credit
EC 330	Intermediate Macroeconomics.....	3
EC 304	Econometrics*.....	3
BU 339	Operations Management*.....	3
	IS Elective.....	3
	BU Elective.....	3
PE 200	Drug and Alcohol Awareness.....	1/2
	AS, MS, or NS.....	2
TOTAL		17 1/2

FIRST (SENIOR) CLASS

First Semester

	Subject	Semester Hrs. Credit
BU 316	Legal Environment of Business*.....	3
BU 330	Management Info. Systems*.....	3
	BU Electives.....	3
	EC Electives.....	6
	Physical Education.....	1/2
	AS, MS, or NS.....	2
TOTAL		17 1/2

Second Semester

	Subject	Semester Hrs. Credit
BU 440	Business Policy*.....	3
	BU Elective.....	3
	EC Elective.....	6
	Free Elective.....	3
	Physical Education.....	1/2
	AS, MS, or NS.....	2
TOTAL		17 1/2

Total Hours: 139 (includes 66 hours of economics and business courses)

***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.

The following courses must be completed with a grade of C or higher: BU 210, 211, 220, 230, 310, 316, 330, 339, 440; EC 201, 202, 300, 303, 304, 330; WR 101, 102; MA 125, 126.

ELECTRICAL AND COMPUTER ENGINEERING CURRICULUM

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 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. Our curriculum is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET).

As such, the Educational Objectives of the Electrical and Computer Engineering Department are:

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.

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 ELECTIVE POLICY

The ECE Department requires six credit hours of ECE electives for graduation. While more than six credit hours of electives may be taken, a maximum of six credit hours may be applied to graduation requirements.

The following three-credit ECE Elective courses are offered regularly, and may be used to satisfy the required six credit hours of ECE Electives:

Fall Semesters: EE 413 (Microelectronics), EE 460 (Portable Power)

Spring Semesters: EE 426 (Semiconductor Devices), EE 455 (Electrical/Mechanical Design)

PROFESSIONAL LICENSURE

Prior to graduation, all engineering cadets are required to take the Fundamentals of Engineering (FE) Examination as an early step toward licensure as a professional engineer.

Effective with the Class of 2013, (Fall 2012 and Spring 2013 FE examinations), all engineering cadets will be responsible for completing and submitting all application paperwork and fees by the published deadlines. Cadets who pass the examination will be fully reimbursed by the department. Cadets who are concerned about the financial obligations associated with this graduation requirement should contact the VMI Financial Aid office immediately.

Any engineering cadet who does not meet these expectations, as determined by the engineering department head, will not meet graduation requirements.

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:
 - o A description of the project
 - o 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 IN ELECTRICAL AND COMPUTER ENGINEERING

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.

SYNOPSIS OF THE B.S. CURRICULUM IN ELECTRICAL AND COMPUTER ENGINEERING

FOURTH (FRESHMAN) CLASS

First Semester

	Subject	Semester Hrs. Credit
EE 111-115	Intro Modules in ECE (1 credit each)	5
WR 101	English Composition I*	3
HI 103	World History	3
MA 123	Calculus I*	3
	AS, MS, or NS	1
TOTAL	.....	15

Second Semester

	Subject	Semester Hrs. Credit
EE 122	DC Circuits*	3
EE 129	Combinational Logic Circuits*	3
WR 102	English Composition II*	3
HI 104	World History	3
MA 124	Calc. II*	3
PE 101/102	Swimming or Boxing	1/2
	AS, MS, or NS	1
TOTAL	.....	16 1/2

THIRD (SOPHOMORE) CLASS

First Semester

	Subject	Semester Hrs. Credit
EE 223	Elec. Cir. Analysis	4
EE 228	Seq. Logic Circuits & Dig Sys Design.....	3
MA 215	Calc. with An. Geom. III	4
MA 311	Elem. Diff. Equations	3
CS 340	Programming	3
PE 101/102	Swimming or Boxing	1/2
	AS, MS, or NS	1
TOTAL	.....	18 1/2

Second Semester

	Subject	Semester Hrs. Credit
MA 220	Prob. & Stat. for Engineers	3
EE 230	Signal & Systems Analysis.	3
EE 255	Electronics	4
CS 422	C++ & Object Oriented Programming	3
CS 221	Discrete Mathematics I.....	3
PE 300	Prin. of Phys. Cond.....	1
	AS, MS, or NS	1
TOTAL	.....	18

SECOND (JUNIOR) CLASS

First Semester

	Subject	Semester Hrs. Credit
EE 381	Automatic Control Systems.....	3
EE 328	Computer Design	3
EE 356	Electronic Appl & Interface	3
PY 160	General Physics I.....	3
PY 155	General Physics I Lab.....	1
PE 211	Wrestling.....	1/2
PS 344	Leadership in Organizations	3
	AS, MS, or NS	2
TOTAL	.....	18 1/2

Second Semester

	Subject	Semester Hrs. Credit
EE 321X	Systems Design I.....	3
EE 339	Microcontrollers	4
EE 372W	Electronic Communications.....	4
PY 161	General Physics II.....	3
PY 156	General Physics II Lab.....	1
SE 300	Public Speaking.....	1
PE 200	Drug and Alcohol Awareness or Elec.	1/2
	AS, MS, or NS	2
TOTAL	.....	18 1/2

FIRST (SENIOR) CLASS

First Semester

	Subject	Semester Hrs. Credit
EE 422	Systems Design II.....	3
EE 431	Dig. Signal Proc.	4
EE 470	Seminar	1
	Electrical and Computer Eng. Elective	3
EE 420	Green Energy Power Conditioning	3
	PE Elective or PE 200.....	1/2
	AS, MS, or NS	2
TOTAL	.....	16 1/2

Second Semester

	Subject	Semester Hrs. Credit
EE 445	Computer Networks	3
EE 471W	ECE Hardware Design Prep.....	1
	ECE Elective	3
	Civilization & Cultures Elective	3
	CC Elective [MA, BI, CH, PY, GE].....	3
	Physical Education Elective.....	1/2
	AS, MS, or NS	2
TOTAL	.....	15 1/2

Total Hours: 137 (includes 66 hours of electrical and computer engineering)

*Minimum Grade of C Required.

Beginning with the Class of 2010, PS 344 (Leadership in Organizations) is a required course for all VMI cadets. This synopsis reflects a proposed placement of this course and other adjustments of the major curriculum that are tentative pending approval of the Academic Board.

ENGLISH CURRICULUM

The English curriculum is designed to give students a foundation in British and American literature, to enhance their ability to analyze texts and articulate their ideas, and to broaden and deepen their cultural knowledge. English majors therefore take a variety of courses not only in literature but also in philosophy, history, foreign languages, classics, the fine arts, writing, and the sciences. With many free electives, they are also able to pursue minors in other departments as well as concentrations in Writing or Fine Arts.

In addition to enriching the lives of students, the study of language and literature prepares students for a variety of careers. The ability to speak and write clearly and effectively, to use research materials creatively, to analyze and interpret written materials of all sorts, to think about people's motives and understand why they act the way they do—these are skills demanded in just about any occupation. With these skills the English major is also prepared for professional training of many kinds. English graduates of the Institute have been successful in graduate schools of law, business, medicine, theology, psychology, and art, as well as English. English graduates are now at work practicing medicine, commanding troops, writing novels, managing businesses, writing for newspapers, creating marketing strategies, raising money, editing periodicals, painting pictures, practicing law, teaching students, and running colleges.

MINOR IN ENGLISH

A cadet majoring in another curriculum may earn a minor in English by completing EN 201 or 202, EN 209, EN 203 or EN 204 and any three upper-level English (EN) or Writing (WR) courses.

MINOR/CONCENTRATION IN FINE ARTS

An English major may earn a concentration in Fine Arts and a cadet majoring in another curriculum may earn a minor by completing FA 251, 252, 340, and three other three-credit Fine Arts courses.

MINOR/CONCENTRATION IN WRITING

A cadet majoring in a curriculum other than English may earn a minor in writing by completing eighteen credit hours: WR 230 (Rhetorical Traditions) and five of the following courses: WR 330, WR 332, WR 334, WR 340, WR 342, WR 345, WR 347, EN 401, EN 406, WR 468 or WR 470. As many as two of the five electives may be replaced by courses across the curriculum that have been approved as writing intensive (i.e., "W" follows the course number). A cadet majoring in English may earn a concentration in writing by meeting these same requirements. Approved electives for English majors also include EN 473W, EN 474W, and EN 496.

INDEPENDENT STUDY

Qualified English majors may take courses in which they choose their own subject, read books related to it, discuss them individually with an instructor, and write essays on the subject. Also, in the departmental **Honors Program**, the cadet may investigate a subject at greater length and eventually write a long paper on a topic like "The Theme of Hunting in American Literature" or "Anthony Trollope as a Legal Historian." (See EN 473-474, EN 495-496, FA 401, and FA 407.)

EXTRACURRICULAR ACTIVITIES

English majors enjoy, of course, the same range of activities as other cadets; but the one special to them is the English Society, which meets in the Daniels Library in Scott Shipp Hall and brings to VMI important poets, novelists, critics, and artists to read and discuss their work. This group and others, like the Timmins-Gentry Music Society, make trips to see plays and films, visit museums, and hear concerts. The Department also sponsors a biennial trip to England for English majors and minors. Eligible English majors and English or Writing minors may join Sigma Tau Delta, an international honor society.

SPECIAL REQUIREMENTS FOR ENGLISH MAJORS

- 1) EN 201* or 202* - Survey of English Literature (3 hours).
- 2) EN 209*- American Literature Survey (3 hours).
- 3) EN 203* or 204*- World Literature (3 hours).
- 4) EN250W-Seminar in Literary Research and Analysis (3 hours).
- 5) Two of the following British pre-1900 courses: EN 308, EN 310, EN 312, EN 316, EN 318, EN 378, EN 413, EN 420, or EN 423. Only one Shakespeare course may count toward this requirement (6 hours).
- 6) Two of the following American Period courses: EN 350, EN 352, EN 356, EN 360, EN 361, or EN 363 (6 hours).
- 7) EN 480W Senior Capstone Course.
- 8) Any four additional English (EN) or Writing (WR) courses, including those listed in (5) and (6) which are not counted in those requirements (12 hours).
- 9) Two three-credit Fine Arts (FA) courses (6 hours).
- 10) One foreign language through the second-year level (6 hours).
- 11) One History (HI) elective, 200-level or above (3 hours).
- 12) PH 201-202- History of Philosophy (6 hours).
- 13) One three-credit science elective. The following courses (or others approved by the head of the English and Fine Arts Department) will satisfy this requirement: AT 201, AT 204, BI 101, BI 102, BI 215, BI 216, BI 218, BI 311, CH 246, CH 396, PY 120, PY 121, PY 160 or PY 161, PY 322, or PY 323 (3 hours).
- 14) Additional electives (of which 6 hours must be in subjects other than English (EN) or Writing (WR)) to make up the total of 136 hours required for graduation. Courses in the following will not count toward this requirement: AS, MS, MU, NS, PE (except PE 430).
- 15) A passing grade on a Senior Portfolio.

*Minimum grade of C required.

SYNOPSIS OF THE B.A. CURRICULUM IN ENGLISH

FOURTH (FRESHMAN) CLASS

First Semester

	Subject	Semester Hrs. Credit
WR 101	English Composition I*	3
HI 103	World History.....	3
MA 105	Intro. Prob. & Stat. I.....	3
	Foreign Language.....	3
	Core Science (BI, CH, or PY).....	4
	AS, MS, or NS	1
TOTAL	.....	17

Second Semester

	Subject	Semester Hrs. Credit
WR 102	English Composition II*	3
HI 104	World History.....	3
MA 106	Intro. Prob. & Stat. II.....	3
	Foreign Language.....	3
	Core Science (BI, CH, or PY).....	4
PE 101	Swimming.....	1/2
	AS, MS, or NS	1
TOTAL	.....	17 1/2

THIRD (SOPHOMORE) CLASS

First Semester

	Subject	Semester Hrs. Credit
EN 201	English Literature*	3
	or EN 203 World Literature*	3
EN 209	American Literature*.....	3
	History Elective.....	3
	Elective (FA).....	3
	Foreign Language.....	3
PE 102	Boxing	1/2
	AS, MS, or NS	1
TOTAL	.....	16 1/2

Second Semester

	Subject	Semester Hrs. Credit
EN 202	English Literature*	3
	or EN 204 World Literature*	3
EN 250W	Sem. In Literary Res. and Analysis.....	3
SE 300	Public Speaking.....	1
	Elective (FA).....	3
PS 344	Leadership in Organizations.....	3
	Foreign Language.....	3
PE 211	Wrestling.....	1/2
	AS, MS, or NS	1
TOTAL	.....	17 1/2

SECOND (JUNIOR) CLASS

First Semester

	Subject	Semester Hrs. Credit
	EN or WR Elective	3
	EN Elective (Pre-1900).....	3
	EN Elective (American Period).....	3
PH 201	Greek & Medieval Philosophy.....	3
	Science Elective	3
PE 300	Principles of Physical Conditioning.....	1
	AS, MS, or NS	2
TOTAL	.....	18

Second Semester

	Subject	Semester Hrs. Credit
	EN or WR Elective	3
	EN Elective (Pre-1900)	3
	EN or WR Elective	3
PH 202	Modern Philosophy	3
	Elective	3
PE 200	Drug & Alcohol Awareness	1/2
	AS, MS, or NS	2
TOTAL	.....	17 1/2

FIRST (SENIOR) CLASS

First Semester

	Subject	Semester Hrs. Credit
	EN Elective (American Period).....	3
EN 480W	Senior Capstone Course	3
	Elective (Non EN or WR).....	3
	Elective (Non EN or WR).....	3
	Elective	3
	Physical Education	1/2
	AS, MS, or NS	2
TOTAL	.....	17 1/2

Second Semester

	Subject	Semester Hrs. Credit
	EN or WR Elective	3
	Elective	3
	Elective	3
	Elective	3
	Physical Education	1/2
	AS, MS, or NS	2
TOTAL	.....	14 1/2

Total Hours: 136 (includes 45 hours of required upper-level EN/FA/WR courses)

SPECIAL REQUIREMENTS FOR ENGLISH MAJORS

- 1) EN 201* or 202* - Survey of English Literature (3 hours).
- 2) EN 209* - American Literature Survey (3 hours).
- 3) EN 203* or 204* - World Literature (3 hours).
- 4) EN 250W - Seminar in Literary Research and Analysis (3 hours).
- 5) Two of the following British pre-1900 courses: EN 308, EN 310, EN 312, EN 316, EN 318, EN 378, EN 413, EN 420, or EN 423. Only one Shakespeare course may count toward this requirement (6 hours).
- 6) Two of the following American Period courses: EN 350, EN 352, EN 356, EN 361, or EN 363 (6 hours).
- 7) EN 480W Senior Capstone Course.
- 8) Any four additional English (EN) or Writing (WR) courses, including those listed in (5) and (6) which are not counted in those requirements (12 hours).
- 9) Two three credit Fine Arts (FA) lecture courses (6 hours).
- 10) One foreign language through the second-year level (6 hours).
- 11) One History (HI) elective, 200-level or above (3 hours).
- 12) PH 201-202- History of Philosophy (6 hours).
- 13) One three-credit science elective. The following courses (or others approved by the head of the English and Fine Arts Department) will satisfy this requirement: AT 201, AT 204, BI 101, BI 102, BI 215, BI 216, BI 218, BI 311, CH 246, CH 396, PY 120, PY 121, PY 160, PY 161, PY 322, or PY 323 (3 hours).
- 14) Additional electives of which 6 hours must be in subjects other than English (EN) or Writing (WR) to make up the total of 136 hours required for graduation. Courses in the following will not count toward this requirement: AS, MS, MU, NS, PE (except PE 430).
- 15) A passing grade on a Senior Portfolio.
- 16) The English and Fine Arts Department adheres to the VMI Transfer Credit Policy; however, it does not grant transfer credit for internet-based or distance-learning courses.

*Minimum grade of C required.

HISTORY CURRICULUM

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.

HISTORY CURRICULUM REQUIREMENTS

See the synopsis of the history curriculum on page 58.

Institute Core Curriculum: Note that WR 101 and 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 105/106, MA 123/124 or MA 125/126. 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, 104, 205 or 205W, 206. History majors must take at least thirty-three hours of history, including the twelve required hours of HI 103, 104, 205 or 205W, and 206, 460W. Please note that the Department of History will not accept Western Civilization courses as a substitute for World History. They can be transferred in only as history electives. Nor does the History Department allow transfer credit for internet-based or distance-learning courses.

Regional Distribution: History majors must take at least one course from each of three regional categories (Europe, United States, and Africa/Asia/Latin America). These categories are designated in the history course listings. Courses may be counted only for one regional category. The Capstone course (460W) cannot be used to satisfy a regional distribution requirement.

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 and Fine Arts.

The third class science elective may be filled with any course offered in astronomy, biology, chemistry, computer science, Geology, or Physics. CE 208 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 and Fine Arts; c) courses in the International Studies Department.

MINOR IN HISTORY

A minor in history is available to cadets majoring in other curricula. The requirements for a minor are HI 103, 104, 205 or 205W, HI 206, all with a grade of C or better, and twelve additional hours of history electives to total twenty-four hours of history.

MINOR IN MILITARY HISTORY

A minor in Military History is available to cadets majoring in other curricula. The requirement for the military history minor are HI 103, 104, 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.

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.

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, 104, 205 or 205W, and 206. The honors sequence consists of HI 372, HI 491W, and HI 492W.

SYNOPSIS OF THE B.A. CURRICULUM IN HISTORY

FOURTH (FRESHMAN) CLASS

First Semester

Subject	Semester Hrs. Credit
Chemistry, Biology or Physics.....	3
Chemistry, Biology or Physics Lab.....	1
WR 101 English Composition I *	3
HI 103 World History*	3
MA Math Sequence I **	3
Foreign Language.....	3
AS, MS, or NS	1
TOTAL	17

Second Semester

Subject	Semester Hrs. Credit
Chemistry, Biology or Physics.....	3
Chemistry, Biology or Physics Lab.....	1
WR 102 English Composition II *	3
HI 104 World History*	3
MA Math Sequence II *	3
Foreign Language.....	3
PE 101/102 Swimming or Boxing	1/2
AS, MS, or NS	1
TOTAL	17 1/2

THIRD (SOPHOMORE) CLASS

First Semester

Subject	Semester Hrs. Credit
EC 201 Principles of Microeconomics	3
English Elective (literature).....	3
HI 205 History of the U.S.*	3
Science Elective or HI 200*	3
Foreign Language.....	3
PE 101/102 Swimming or Boxing	1/2
AS, MS, or NS	1
TOTAL	16 1/2

Second Semester

Subject	Semester Hrs. Credit
EC 202 Principles of Macroeconomics	3
English Elective (literature).....	3
HI 206 History of the U.S.*	3
Science Elective or HI 200*	3
Foreign Language.....	3
PE 211 Wrestling.....	1/2
AS, MS, or NS	1
TOTAL	16 1/2

SECOND (JUNIOR) CLASS

First Semester

Subject	Semester Hrs. Credit
Restricted Elective.....	3
Electives (HI).....	6
PS 344 Leadership in Organizations	3
Foreign Language.....	3
PE 300 Prin. Physical Conditioning.....	1
SE 300 Public Speaking.....	1
AS, MS, or NS	2
TOTAL	19

Second Semester

Subject	Semester Hrs. Credit
Restricted Elective.....	3
Electives (HI)	6
Elective	3
Foreign Language.....	3
PE 200 Drug and Alcohol Awareness	1/2
AS, MS, or NS	2
TOTAL	17 1/2

FIRST (SENIOR) CLASS

First Semester

Subject	Semester Hrs. Credit
Restricted Elective.....	3
HI 460W Capstone Experience	3
Electives	6
Elective (Non-HI).....	3
Physical Education	1/2
AS, MS, or NS	2
TOTAL	17 1/2

Second Semester

Subject	Semester Hrs. Credit
Restricted Elective.....	3
Electives (HI).....	6
Elective (Non-HI).....	3
Physical Education	1/2
AS, MS, or NS	2
TOTAL	14 1/2

Total Hours: 136 (includes 33 hours of history)

* Minimum grade of C required.

** The mathematics sequence may be filled with the following course sequences: MA 105/106, MA 123/124 or MA 125/126 (A grade of C or better required for MA 123 & MA 125).

INTERNATIONAL STUDIES AND POLITICAL SCIENCE CURRICULUM

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.

INTERNATIONAL STUDIES CURRICULUM REQUIREMENTS

See the synopsis of the International Studies curriculum on the next page.

Institute Core Curriculum: Note that WR 101 and 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 Department.

International Studies Core Curriculum: IS majors must complete the following courses with a grade of C or better: HI 205-206, IS 201, 210, 220, 230, 301, 310, 320, 340, 401W, and EC 306. Political Science electives should be filled with any IS course or SS course offered in the Department of International Studies and Political Science.

Economics electives may be filled from the following courses: EC 300, 307, 330, 401, 404, 408, 410, 414, 452 and BU 306.

English (EN) and Writing (WR) electives should be filled with any literature course at VMI, as well as WR 330, WR 332, WR 340, WR 345.

The science elective may be filled from the following courses: AT 201, 204, BI 215, 311, 312, EL 201, 402, GE 201, 202, 204, PY 201, 202.

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 permitted. Consult with the Head of the International Studies Department.

HONORS IN INTERNATIONAL STUDIES

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.

MINOR IN 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.

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/>

SYNOPSIS OF THE B.A. CURRICULUM IN INTERNATIONAL STUDIES AND POLITICAL SCIENCE

FOURTH (FRESHMAN) CLASS

First Semester

	Subject	Semester Hrs. Credit
	Chemistry, Biology or Physics.....	3
	Chemistry, Biology or Physics Lab.....	1
WR 101	English Composition I*	3
HI 103	World History	3
MA 105	Intro. Prob. & Stat.I	3
	Foreign Language.....	3
	AS, MS, or NS	1
TOTAL	.....	17

Second Semester

	Subject	Semester Hrs. Credit
	Chemistry, Biology or Physics.....	3
	Chemistry, Biology or Physics Lab.....	1
WR 102	English Composition II*	3
HI 104	World History	3
MA 106	Intro. Prob. And Stat.II.....	3
	Foreign Language.....	3
PE 101/102	Swimming or Boxing	1/2
	AS, MS, or NS	1
TOTAL	.....	17 1/2

THIRD (SOPHOMORE) CLASS

First Semester

	Subject	Semester Hrs. Credit
EC 201	Principles of Microeconomics	3
	English (EN) or Writing (WR) Elective.....	3
HI 205	History of the U.S.*	3
IS 201	Intro. to International Studies*.....	3
	Foreign Language.....	3
PE 101/102	Swimming or Boxing	1/2
	AS, MS, or NS	1
TOTAL	.....	16 1/2

Second Semester

	Subject	Semester Hrs. Credit
EC 202	Principles of Macroeconomics.....	3
HI 206	History of the U.S.*	3
IS 220/230	Inter. Politics or Comparative Politics*	3
	Foreign Language.....	3
	Elective	3
PE 211	Wrestling.....	1/2
	AS, MS, or NS	1
TOTAL	.....	16 1/2

SECOND (JUNIOR) CLASS

First Semester

	Subject	Semester Hrs. Credit
EC 306	International Econ*	3
IS 301	Tech. of Comp. Analysis **	3
SE 300	Public Speaking.....	1
	Foreign Language.....	3
PS 344	Leadership in Organizations.....	3
PE 300	Prin. Physical Conditioning.....	1
	AS, MS, or NS	2
TOTAL	.....	16

Second Semester

	Subject	Semester Hrs. Credit
IS 210	American Gov't*.....	3
	Science Elective	3
	English (EN) or Writing (WR) Elective.....	3
IS 320	Natl. Security Policy*	3
	Foreign Language.....	3
	Physical Education	1/2
	AS, MS, or NS	2
TOTAL	.....	17 1/2

FIRST (SENIOR) CLASS

First Semester

	Subject	Semester Hrs. Credit
IS 310	American Foreign Policy*	3
	Electives (IS)	6
	Elective +	6
PE 200	Drug and Alcohol Awareness	1/2
	AS, MS, or NS	2
TOTAL	.....	17 1/2

Second Semester

	Subject	Semester Hrs. Credit
IS 340	Political Theory*.....	3
IS 401W	International Studies Semin*	3
	Elective (EC).....	3
	Electives +	6
	Physical Education	1/2
	AS, MS, or NS	2
TOTAL	.....	17 1/2

Total Hours: 136 (includes 30 hours of political science)

*Minimum Grade of "C" Required

*Must be attempted in the 3rd class year or in 2nd class year if transferring from another department. Open only to IS majors.

**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 CURRICULUM

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 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.

The mission of the Mechanical Engineering Department is to prepare graduates for graduate studies, for a professional engineering career, or for a career in the military through a continually improving curriculum of courses in engineering, related sciences, mathematics, and humanities which will allow the student to possess:

Educational Objective 1

Enable the student to develop the ability to identify, formulate, and solve engineering problems in both the thermal/fluids, mechanical design and related areas.

Supporting Program Outcomes:

- 1.1 Graduates will have the ability to apply the knowledge of mathematics (through multivariate calculus and differential equations), science (through chemistry and calculus-based physics), and engineering to engineering problems in the thermal and mechanical design areas.
- 1.2 Graduates will have the ability to analyze, and design mechanical and thermal systems, components and processes incorporating applicable engineering standards and realistic constraints.
- 1.3 Graduates will have the ability to design and conduct experiments, and to analyze and interpret experimental results.
- 1.4 Graduates will have the ability to use modern computational and analytical techniques, skills and tools.

Educational Objective 2

Enable the student to develop the professional skills and awareness necessary to responsibly practice engineering in a global and societal context.

Supporting Program Outcomes:

- 2.1 Graduates will have effective oral and written communication skills.
- 2.2 Graduates will have the ability to effectively function on teams.

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

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; Computation Lab; Instrumentation Lab; Manufacturing and Robotics Lab; Materials Lab. Laboratories are designed as an extension of classroom work and provide technological experiments considered important to the engineering student. Cadets are provided practical hands-on experience on modern equipment. The department strongly emphasizes the use of computers for problem solving. A programming language is taught using microcomputers, and computer-aided drafting (CAD) is taught as a companion element in the drawing course. Both programming and CAD, as well as other computer applications, become an integral part of most courses taught in the department.

The Mechanical Engineering Department has been in existence since 1941 as a service department to the other engineering departments. The new curriculum, started in 1982, produced its first graduates in May 1985 and is accredited by ABET, Inc.

The department sponsors a student section of the ASME (American Society of Mechanical Engineers). Participation in professional activities is emphasized. Cadets are 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. Have an overall 3.00 quality point average in all classes (through the end of his/her 2nd class year).
- B. Have an overall 3.25 quality point average in all Mechanical Engineering classes (through the end of his/her 2nd class year).
- C. Have a 3.00 quality point average in all classes at graduation.
- D. Have a 3.25 quality point average in all Mechanical Engineering classes at graduation.

2. Application and Administrative Procedures

Each candidate must:

- 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.
- B. Register for 2 semesters of the Independent Study sequence (ME 461-ME 462).
- C. Find a faculty adviser who is willing to supervise their Independent Study.
- 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:

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

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 (3-0-3)
ME 314 Fluid Mechanics (3-1-3.5)

Also must complete 3 of the following 6 courses

ME 413 Aircraft Propulsion Systems (3-0-3)
ME 415 Flight Mechanics (3-0-3)
ME 416 Fundamentals of Aerodynamics (3-0-3)
ME 417 Aircraft Structural Analysis (3-0-3)
ME 481 Computational Modeling and Virtual Design (Aerospace Project) (3-0-3)
ME 484 Fiber Reinforced Composite Materials (3-0-3) (Aerospace Project)

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 courses:

ME 311 Thermodynamics I
ME 313 Thermodynamics II
ME 314 Fluid Dynamics or CE 309 Fluid Mechanics

Elective Courses (choose two out of three).

ME 431 Power Plant Design
PY 344 Nuclear Physics
PY 453 Nuclear Reactor Engineering

ADDITIONAL INFORMATION

Applicants considering mechanical engineering 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 engineering drawing (drafting) and computer programming are also recommended, but they should not be taken in lieu of elements of the college preparatory sequence.

SYNOPSIS OF THE B.S. CURRICULUM IN MECHANICAL ENGINEERING

FOURTH (FRESHMAN) CLASS

First Semester

	Subject	Semester Hrs. Credit
CH 117	Lab for CH 137	1
CH 137	Intro. College Chemistry I	3
WR 101	English Composition I*	3
HI 103	History.....	3
MA 123	Calc. with An. Geom. I*	3
ME 105	Intro. to Mech. Eng.	1
ME 109	CAD/Solid Model	1
	AS, MS, or NS.....	1
TOTAL	.....	16

Second Semester

	Subject	Semester Hrs. Credit
WR 102	English Composition II*	3
HI 104	History.....	3
MA 103	Matrix Algebra.....	2
MA 124	Calculus with An. Geom. II*	3
ME 110	Materials	3
ME 203	Programming	2
PE 101	Swimming	1/2
	AS, MS, or NS.....	1
TOTAL	.....	17 1/2

THIRD (SOPHOMORE) CLASS

First Semester

	Subject	Semester Hrs. Credit
MA 215	Calc. with An. Geom. III	4
MA 220	Probability and Statistics	3
ME 201	Statics	3
PY 160	Gen Physics I.....	3
PY 155	Physics Lab.....	1
PE 102	Boxing.....	1/2
SE 300	Public Speaking	1
	AS, MS, or NS.....	1
TOTAL	.....	16 1/2

Second Semester

	Subject	Semester Hrs. Credit
MA 311	Differential Equations	3
ME 206	Solid Mechanics.	3
ME 311	Thermodynamics	3
PS 344	Leadership in Organizations**	3
PY 161	Gen. Physics II	3
PY 156	Physics Lab II.....	1
PE 300	Prin. of Physical Conditioning.....	1
	AS, MS, or NS.....	1
TOTAL	.....	18

SECOND (JUNIOR) CLASS

First Semester

	Subject	Semester Hrs. Credit
EC 322	Engr. Economy.....	2
EE 351	Elec. Cir. & Machines**.....	3
ME 302	Dynamics	3
ME 313	Thermodynamics II	3 1/2
ME 325	Instrumentation Lab	2
	Civil & Cultures.....	3
PE 211	Wrestling	1/2
	AS, MS, or NS.....	2
TOTAL	.....	19

Second Semester

	Subject	Semester Hrs. Credit
ME 314	Fluid Mechanics.....	3 1/2
ME 321	Dynamics of Machinery	3
ME 322	Mech. Analysis.....	3
ME 336	Heat and Mass Transfer	3 1/2
ME 342	Controls	3
PE 200	Drug and Alcohol Awareness.....	1/2
	AS, MS, or NS.....	2
TOTAL	.....	18 1/2

FIRST (SENIOR) CLASS

First Semester

	Subject	Semester Hrs. Credit
ME 419	Thermal-Fluid Systems Design.....	4
ME 425	Mech. Design.....	4
ME 457	Seminar.....	1/2
	Technical Elective.....	3
	Technical Elective.....	3
	Physical Education	1/2
	AS, MS, or NS.....	2
TOTAL	.....	17

Second Semester

	Subject	Semester Hrs. Credit
ME 444	Mechanical Engr. Design	3
	Technical Elective.....	3
	Elective.....	3
	Math/Science Elective	3
	Civil & Cultures.....	3
ME 458	Seminar	0
	Physical Education	1/2
	AS, MS, or NS.....	2
TOTAL	.....	17 1/2

Total Hours: 140 (includes 54 hours of specified mechanical engineering courses)

Electives are chosen from the distribution requirements shown on the next page.

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, CS, 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.

CIVILIZATION AND CULTURES ELECTIVES

Six (6) hours must be selected from the approved list of Civilization 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 330WX) or an approved science course from BI, CH, or PY

MODERN LANGUAGES AND CULTURES CURRICULUM

The Department of Modern Languages and Cultures offers an interdisciplinary major that requires in-depth study of Arabic, French, German, Japanese, 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.

A cadet may earn a bachelor's degree in two ways (please consult the "Synopsis of the Modern Languages and Cultures Curriculum") :

(1). He or she 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.

(2). He or she must take all prescribed courses and acquire a minimum of 12 credit hours above the 200-level in one foreign language (a minimum of 3 credit hours must be earned in a 400-level language course). In addition, cadets must earn 3 credit hours above the 200-level in another language. Students who choose this option are required to take all history and political science courses that correspond to their principal language and must also complete 9 additional hours of free electives.

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; B.A. in Modern Languages and Cultures - French and Arabic).

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.

MINOR IN MODERN LANGUAGES AND CULTURES

A cadet who wishes to earn a minor in Modern Languages and Cultures must complete a "Minor Declaration Form" and earn 12 credit hours above the 200-level in a foreign language (a minimum of 3 credit hours must be earned in a 400-level language course). In addition, cadets must take all courses prescribed in the curriculum.

MINOR IN MODERN LANGUAGES

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. Minors may concentrate their work in the following configurations:

(1). A cadet may earn a minor by successfully completing 12 credit hours above the 200-level of the chosen language. 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.

(2). A cadet may earn a minor in Modern Languages by earning 6 hours on the 300 level of one language and 6 hours at the 200-or higher level of another language. Cadets pursuing this track may choose among the languages offered by the department and will be awarded a minor in Modern Languages.

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.

SYNOPSIS OF THE B.A. CURRICULUM IN MODERN LANGUAGES AND CULTURES

FOURTH (FRESHMAN) CLASS

First Semester

	Subject	Semester Hrs. Credit
	BI/CH/PY.....	4
WR 101	English Composition I*.....	3
HI 103	World History.....	3
MA 105	Intro. Prob. & Statistics I.....	3
ML #	.....	3
	AS, MS, or NS.....	1
TOTAL	.....	17

Second Semester

	Subject	Semester Hrs. Credit
	BI/CH/PY.....	4
WR 102	English Composition II*.....	3
HI 104	World History.....	3
MA 106	Intro. Prob. & Statistics.....	3
ML #	.....	3
PE 102	Boxing.....	1/2
	AS, MS, or NS.....	1
TOTAL	.....	17 1/2

THIRD (SOPHOMORE) CLASS

First Semester

	Subject	Semester Hrs. Credit
EC 201	Principles of Microeconomics.....	3
	EN/FA/WR Elective.....	3
	Science Elective.....	3
ML #	.....	3
	Elective.....	3
PE 101	Swimming.....	1/2
	AS, MS, or NS.....	1
TOTAL	.....	16 1/2

Second Semester

	Subject	Semester Hrs. Credit
EC 202	Principles of Macroeconomics.....	3
	EN/FA/WR Elective.....	3
HI 325	AM. For Relations.....	3
ML #	.....	3
	Elective.....	3
SE 300	Public Speaking.....	1
PE 211	Wrestling.....	1/2
	AS, MS, or NS.....	1
TOTAL	.....	17 1/2

SECOND (JUNIOR) CLASS

First Semester

	Subject	Semester Hrs. Credit
EC 306	International Economics.....	3
HI** #	.....	3
ML #	.....	3
ML #	.....	3
PS 344	Leadership in Organizations.....	3
PE 300	Principles of Physical Conditioning.....	1
	AS, MS, or NS.....	2
TOTAL	.....	18

Second Semester

	Subject	Semester Hrs. Credit
HI** #	.....	3
ML #	.....	3
ML #	.....	3
	Elective.....	3
IS 220	International Politics.....	3
PE 200	Drugs and Alcohol Awareness.....	1/2
	AS, MS, or NS.....	2
TOTAL	.....	17 1/2

FIRST (SENIOR) CLASS

First Semester

	Subject	Semester Hrs. Credit
ML 450	Capstone.....	3
ML	.....	6
IS	Elective***.....	3
	Elective.....	3
	Elective.....	3
	Physical Education.....	1/2
	AS, MS, or NS.....	2
TOTAL	.....	17 1/2

Second Semester

	Subject	Semester Hrs. Credit
ML	.....	3
ML	.....	3
	Elective.....	3
	IS Elective.....	3
	Physical Education.....	1/2
	AS, MS, or NS.....	2
TOTAL	.....	14 1/2

Total Hours: 136 (includes 39 hours of language-based courses)

* 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
FR= HI 350 France and the French Empire; HI 365 The French Revolution and Napoleon

GR = HI 361 The Age of Blood and Iron; HI 375 Germany and Eastern Europe

JP= Any 300-level or 400-level History course; HI 346 Modern Japan

SP= HI 373 Colonial Latin America; HI 374 Modern Latin America; HI 388

Modern Spain; Civil War-Colonial Conflict.

***Cadets are required to take a IS course appropriate to their foreign language area(s):

AR = Any 300 level IS course

FR and GR = IS 330 Politics and Western Europe

JP = IS 345 Politics in East Asia

SP = IS 335 Politics in Latin America or IS 330W Politics in Western Europe

#Cadets must take two civilization & cultures designated courses

PHYSICS CURRICULUM

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).

Our B.A. physics degree program is well suited to the student who wants to major in physics but who also has strong interests in the humanities or social sciences. The B.A. degree program is also designed to allow those cadets interested in teaching physics at the high school level to work toward teacher certification while they complete their physics degree. With 21 credit hours of free electives, the B.A. option allows a cadet to pursue a second area of study in depth, and it is expected that some of the free elective hours will be used to obtain a minor or to pursue a double major. There are also 9 hours of technical electives and 9 hours of physics electives (at the 200, 300, or 400 level). Finally, cadets pursuing the B.A. are required to meet a four semester foreign language requirement or demonstrate equivalent proficiency.

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 fulltime 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.

MINOR IN PHYSICS

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, PY 161, PY 155, and PY 156
2. Modern Physics
PY 335 Modern Physics I
3. At least 9 additional hours of courses are required. Those courses must be selected from the following: AT 306, PY 253W, PY 254, PY 308, PY 333W, PY 334, PY 341, PY 342, PY 344, PY 336, PY 441, PY 446, PY 453, PY 257, PY 459, PY 460.
4. A minimum GPA of 2.0 is required in all courses required for the minor.

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.

MINOR IN 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:

PY 160-161 and PY 155-156
AT 201 - The Solar System
AT 204 - Stars, Galaxies, and the Universe
AT 301 - Observational Techniques
AT 306 - Introductory Astrophysics

A minimum GPA of 2.0 is required in all courses required for the minor.

SYNOPSIS OF THE B.S. CURRICULUM IN PHYSICS

FOURTH (FRESHMAN) CLASS

First Semester

	Subject	Semester Hrs. Credit
CH 111	Lab for CH 131	1
CH 131	Chemical Science I	3
WR 101	English Composition I*	3
HI 103	World History	3
MA 123	Calc. with An. Geom. I*	3
PY 160	General Physics I	3
PY 155	Lab for General Physics I	1
	AS, MS, or NS	1
TOTAL	.....	18

Second Semester

	Subject	Semester Hrs. Credit
CH 112	Lab for CH 132	1
CH 132	Chemical Science II	3
WR 102	English Composition II*	3
HI 104	World History	3
MA 124	Calc. with An. Geom. II*	3
PY 161	General Physics II	3
PY 156	Lab for General Physics II	1
PE 101/102	Swimming or Boxing	1/2
	AS, MS, or NS	1
TOTAL	.....	18 1/2

THIRD (SOPHOMORE) CLASS

First Semester

	Subject	Semester Hrs. Credit
MA 103	Matrix Algebra	2
MA 215	Calc with An. Geom. III	4
PY 238	Laboratory Techniques	2
PY 254	Optics	3
PY 253W	Optics Lab	1
PE 200	Drug and Alcohol Awareness	1/2
	Free Elective	3
	AS, MS, or NS	1
TOTAL	.....	16 1/2

Second Semester

	Subject	Semester Hrs. Credit
MA 311	Elem. Dif. Eq.	3
PY 223	Programming & Data Analysis	2
PY 257	Electronics and Interfacing	4
PS 344	Leadership in Organizations	3
	Tech Elective	3
PE 101/102	Swimming or Boxing	1/2
	AS, MS, or NS	1
TOTAL	.....	16 1/2

SECOND (JUNIOR) CLASS

First Semester

	Subject	Semester Hrs. Credit
MA 301	Higher Math Engr. Sc.	3
PY 341	Elec. & Mag. I	3
PY 333W	Modern Physics Lab	1
PY 335	Modern Physics I	3
PE 300	Prin. Physical Cond.	1
	Hum. or Soc. Science Elective	3
	AS, MS, or NS	2
TOTAL	.....	16

Second Semester

	Subject	Semester Hrs. Credit
PY 336	Modern Physics II	3
PY 342	Elec. & Mag. II	3
PY 441	Classical Mechanics I	3
	Tech Elective	3
	Free Elective	3
PE 211	Wrestling	1/2
	AS, MS, or NS	2
TOTAL	.....	17 1/2

FIRST (SENIOR) CLASS

First Semester

	Subject	Semester Hrs. Credit
PY 420	Capstone I	2
PY 459	Intro. Quantum Mech	3
	Hum. or Soc. Science Elective	3
	Tech Elective	3
	Free Elective	3
	Physical Education	1/2
	AS, MS, or NS	2
TOTAL	.....	16 1/2

Second Semester

	Subject	Semester Hrs. Credit
PY 421	Capstone II	1
PY 446	Thermal Physics	3
SE 300	Public Speaking	1
	Tech Elective	3
	Free Elective	3
	Free Elective	3
	Physical Education	1/2
	AS, MS, or NS	2
TOTAL	.....	16 1/2

Total Hours: 136 (includes 45 hours of physics courses)

See text for a discussion of elective requirements

*Minimum grade of C required

SYNOPSIS OF THE B.S. CURRICULUM IN PHYSICS (NUCLEAR)

FOURTH (FRESHMAN) CLASS

First Semester

	Subject	Semester Hrs. Credit
CH 111	Lab for CH 131	1
CH 131	Chemical Science I	3
WR 101	English Composition I*	3
HI 103	World History	3
MA 123	Calc. with An. Geom. I*	3
PY 160	General Physics I	3
PY 155	Lab for General Physics I	1
	AS, MS, or NS	1
TOTAL	.....	18

Second Semester

	Subject	Semester Hrs. Credit
CH 112	Lab for CH 132	1
CH 132	Chemical Science II	3
WR 102	English Composition II*	3
HI 104	World History	3
MA 124	Calc. with An. Geom. II*	3
PY 161	General Physics II	3
PY 156	Lab for General Physics II	1
PE 101/102	Swimming or Boxing	1/2
	AS, MS, or NS	1
TOTAL	.....	18 1/2

THIRD (SOPHOMORE) CLASS

First Semester

	Subject	Semester Hrs. Credit
MA 103	Matrix Algebra	2
MA 215	Calc with An. Geom. III	4
PY 238	Laboratory Techniques	2
PY 254	Optics	3
PY 253W	Optics Lab	1
PE 200	Drug and Alcohol Awareness	1/2
	Free Elective	3
	AS, MS, or NS	1
TOTAL	.....	16 1/2

Second Semester

	Subject	Semester Hrs. Credit
MA 311	Elem. Dif. Eq.	3
ME 311	Thermodynamics I	3
PY 223	Programming & Data Analysis	2
PY 257	Electronics and Interfacing	4
PS 344	Leadership in Organizations	3
PE 101/102	Swimming or Boxing	1/2
	AS, MS, or NS	1
TOTAL	.....	16 1/2

SECOND (JUNIOR) CLASS

First Semester

	Subject	Semester Hrs. Credit
MA 301	Higher Math Engr. Sc.	3
ME 314	Fluid Mechanics	3 1/2
PY 333W	Modern Physics Lab	1
PY 335	Modern Physics I	3
PE 300	Prin. Physical Cond.	1
	Hum. or Soc. Science Elective.	3
	AS, MS, or NS	2
TOTAL	.....	16 1/2

Second Semester

	Subject	Semester Hrs. Credit
ME 336	Heat and Mass Transfer	3 1/2
PY 336	Modern Physics II	3
PY 441	Classical Mechanics I	3
PY 344	Nuclear Physics	3
	Free Elective	3
PE 211	Wrestling	1/2
	AS, MS, or NS	2
TOTAL	.....	18

FIRST (SENIOR) CLASS

First Semester

	Subject	Semester Hrs. Credit
PY 420	Capstone I	2
	Physics Elective	3
	Nuclear Energy Elective**	3
	Tech Elective	3
	Free Elective	3
	Physical Education	1/2
	AS, MS, or NS	2
TOTAL	.....	16 1/2

Second Semester

	Subject	Semester Hrs. Credit
PY 421	Capstone II	1
SE 300	Public Speaking	1
	Physics Elective	3
	Tech Elective	3
	Free Elective	3
	Hum. or Soc. Science Elective	3
	Physical Education	1/2
	AS, MS, or NS	2
TOTAL	.....	16 1/2

Total Hours: 137 (includes 42-45 hours of physics courses)

*Minimum grade of C required

**Chosen from PY 453 Nuclear Reactor Engineering or ME 431 Power Plant Design (note additional ME prerequisites for this course).

SYNOPSIS OF THE B.A. CURRICULUM IN PHYSICS

FOURTH (FRESHMAN) CLASS

First Semester

	Subject	Semester Hrs. Credit
CH 111	Lab for CH 131	1
CH 131	Chemical Science I	3
WR 101	English Composition I*	3
MA 123	Calc. with An. Geom. I*	3
PY 160	General Physics I	3
PY 155	Lab for General Physics I	1
	AS, MS, or NS	1
TOTAL	.....	15

Second Semester

	Subject	Semester Hrs. Credit
CH 112	Lab for CH 132	1
CH 132	Chemical Science II	3
WR 102	English Composition II*	3
MA 124	Calc. with An. Geom. II*	3
PY 161	General Physics II	3
PY 156	Lab for General Physics II	1
	Free Elective	3
PE 101/102	Swimming or Boxing	1/2
	AS, MS, or NS	1
TOTAL	.....	18 1/2

THIRD (SOPHOMORE) CLASS

First Semester

	Subject	Semester Hrs. Credit
HI 103	World History	3
MA 103	Matrix Algebra	2
MA 215	Calc with An. Geom. III	4
PY 254	Optics	3
PY 238	Laboratory Techniques	2
PE 200	Drug and Alcohol Awareness	1/2
	Foreign Language	3
	AS, MS, or NS	1
TOTAL	.....	18 1/2

Second Semester

	Subject	Semester Hrs. Credit
HI 104	World History	3
MA 311	Elem. Dif. Eq.	3
PY 223	Programming & Data Analysis	2
PY 220	Physics Topics Seminar	1
PS 344	Leadership in Organizations	3
PE 101/102	Swimming or Boxing	1/2
	Foreign Language	3
	AS, MS, or NS	1
TOTAL	.....	16 1/2

SECOND (JUNIOR) CLASS

First Semester

	Subject	Semester Hrs. Credit
PY 335	Modern Physics I	3
PY 333W	Modern Physics Lab	1
PE 300	Prin. Physical Cond.	1
	PY Elective	3
	Free Elective	3
	Foreign Language	3
	AS, MS, or NS	2
TOTAL	.....	16

Second Semester

	Subject	Semester Hrs. Credit
PY 336	Modern Physics II	3
PY 441	Classical Mechanics I	3
PE 211	Wrestling	1/2
	Tech Elective	3
	PY Elective	3
	Foreign Language	3
	AS, MS, or NS	2
TOTAL	.....	17 1/2

FIRST (SENIOR) CLASS

First Semester

	Subject	Semester Hrs. Credit
PY 420	Capstone I	2
	Physics Elective	3
	Tech Elective	3
	Free Elective	3
	Free Elective	3
	Physical Education	1/2
	AS, MS, or NS	2
TOTAL	.....	16 1/2

Second Semester

	Subject	Semester Hrs. Credit
PY 421	Capstone II	1
SE 300	Public Speaking	1
	Tech Elective	3
	Free Elective	3
	Free Elective	3
	Free Elective	3
	Physical Education	1/2
	AS, MS, or NS	2
TOTAL	.....	16 1/2

Total Hours: 135 (includes 38 hours of physics courses)

See text for a discussion of elective requirements

*Minimum grade of C required

PSYCHOLOGY CURRICULA

The Department of Psychology and Philosophy offers Bachelor of Arts and Bachelor of Science degrees in psychology, and minors in leadership studies, philosophy, 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.

PSYCHOLOGY CURRICULA REQUIREMENTS

The psychology curriculum for the Bachelor of Science degree requires 136 hours to graduate, of which 39 must be in psychology. The curriculum for the Bachelor of Arts degree requires 136 hours, of which 39 must be in psychology. (Note: PS 201, WR 101, WR 102, and MA 123 must be passed with a grade of C or better.)

MINOR IN LEADERSHIP STUDIES

See Special Programs, page 74.

MINOR IN PHILOSOPHY

To qualify for a minor in philosophy, a cadet must complete a minimum of 15 hours in philosophy with a grade of C or better in each course. Required courses include PH 201/202/301. The remaining six hours must be selected from PH 304/307, IS 340, EN 406, or EC 408. Additionally, any other course with a PH prefix may be counted as an elective.

Upon electing to minor in philosophy, the cadet must obtain the approval of the department head in his or her own major curriculum, and the head of the Department of Psychology and Philosophy.

MINOR IN 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. All candidates must complete PS 201. Six hours must be selected from PS 203, PS 204, PS 301 or PS 401. Six hours must be selected from PS 302, PS 305, PS 307 or PS 315. The remaining three hours may be chosen from any PS coursework or PH 308.

Upon electing to minor in psychology, approval must be obtained from the major curriculum head and the head of the Department of Psychology and Philosophy.

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 and Philosophy for specific requirements regarding eligibility and application and administrative procedures.

SYNOPSIS OF THE B.S. CURRICULUM IN PSYCHOLOGY

FOURTH (FRESHMAN) CLASS

First Semester

	Subject	Semester Hrs. Credit
BI 101	General Biology I.....	4
	Science Elective**	4
HI 103	World History	3
WR 101	English Composition I *	3
	AS, MS, or NS	1
TOTAL	.....	15

Second Semester

	Subject	Semester Hrs. Credit
BI 102	General Biology II.....	4
	Science Elective **	4
HI 104	World History	3
WR 102	English Composition II *	3
PE 101	Basic Swimming and Survival.....	1/2
	AS, MS, or NS	1
TOTAL	.....	15 1/2

THIRD (SOPHOMORE) CLASS

First Semester

	Subject	Semester Hrs. Credit
MA 123	Calculus and Analytical Geometry I *	3
PS 203	Biopsychology I	3
	Science Elective **	4
PS 201	Intro. to Psychology*	3
PH 202/308	Hist. of Mod. Phil or Minds and Mach	3
PE 102	Boxing.....	1/2
	AS, MS, or NS	1
TOTAL	.....	17 1/2

Second Semester

	Subject	Semester Hrs. Credit
MA 124	Calculus & Analytical Geometry II.....	3
PS 204	Biopsychology II.....	3
	Science Elective**	3
PS 307	Developmental Psychology	3
	Free Elective.....	3
PE 200	Drug and Alcohol Abuse Awareness.....	1/2
SE 300	Public Speaking	1
	AS, MS, or NS	1
TOTAL	.....	17 1/2

SECOND (JUNIOR) CLASS

First Semester

	Subject	Semester Hrs. Credit
MA 220	Prob & Stat for Engineers & Scientists.....	3
	Science Elective**	3
PS 302	Social Psychology.....	3
PS 305	Abnormal Psychology	3
PS 344	Leadership in Organizations	3
PE 211	Wrestling	1/2
	AS, MS, or NS.....	2
TOTAL	.....	17 1/2

Second Semester

	Subject	Semester Hrs. Credit
MA 307	App. Statistics for the Social Sciences.....	3
	PH Elective	3
PS 301	Psychology of Learning	3
PS 315	Theories of Personality	3
PS 402W	Research Methods.....	3
PE 300	Principles of Physical Conditioning	1
	AS, MS, or NS	2
TOTAL	.....	18

FIRST (SENIOR) CLASS

First Semester

	Subject	Semester Hrs. Credit
PS 401	Cognition.....	3
	Free Elective.....	3
	Free Elective.....	3
	Science Elective **	3
PS 403W	Independent Project.....	3
	PE Elective	1/2
	AS, MS, or NS	2
TOTAL	.....	17 1/2

Second Semester

	Subject	Semester Hrs. Credit
PS 404	History & Systems.....	3
	Free Elective.....	3
	Free Elective.....	3
	Free Elective.....	3
	PE Elective	1/2
	Science Elective **	3
	AS, MS, or NS	2
TOTAL	.....	17 1/2

Total Hours: 136 (includes 39 hours of psychology courses)

*Minimum Grade of C required.

**Must be taken from: AT, BI, CH, CS, or PY.

SYNOPSIS OF THE B.A. CURRICULUM IN PSYCHOLOGY

FOURTH (FRESHMAN) CLASS

First Semester

	Subject	Semester Hrs. Credit
BI 101	General Biology I.....	4
WR 101	English Composition I *.....	3
HI 103	World History.....	3
MA 105	Intro. Prob. And Stat. I.....	3
	Foreign Language 101.....	3
	AS, MS, or NS.....	1
TOTAL		17

Second Semester

	Subject	Semester Hrs. Credit
BI 102	General Biology II.....	4
WR 102	English Composition II **.....	3
HI 104	World History.....	3
MA 106	Intro. Prob. And Stat. II.....	3
	Foreign Language 102.....	3
PE 101	Basic Swimming and Survival.....	1/2
	AS, MS, or NS.....	1
TOTAL		17 1/2

THIRD (SOPHOMORE) CLASS

First Semester

	Subject	Semester Hrs. Credit
MA 307	Stat. for Social Sciences.....	3
PH 202/308	Hist. of Mod. Phil. Or Minds & Machines.....	3
PS 201	Intro. to Psychology*.....	3
PS 203	Biopsychology I.....	3
	Foreign Language 201.....	3
PE 102	Boxing.....	1/2
	AS, MS, or NS.....	1
TOTAL		16 1/2

Second Semester

	Subject	Semester Hrs. Credit
PS 204	Biopsychology II.....	3
PS 307	Developmental Psychology.....	3
	Free Elective.....	3
	Foreign Language 202.....	3
	PH Elective.....	3
PE 200	Drug and Alcohol Abuse Awareness.....	1/2
SE 300	Public Speaking.....	1
	AS, MS, or NS.....	1
TOTAL		17 1/2

SECOND (JUNIOR) CLASS

First Semester

	Subject	Semester Hrs. Credit
PS 302	Social Psychology.....	3
PS 305	Abnormal Psychology.....	3
PS 344	Leadership in Organizations.....	3
	Elective (Science) **.....	3
	Free Elective.....	3
PE 211	Wrestling.....	1/2
	AS, MS, or NS.....	2
TOTAL		17 1/2

Second Semester

	Subject	Semester Hrs. Credit
PS 301	Psychology of Learning.....	3
PS 315	Theories of Personality.....	3
PS 402W	Research Methods.....	3
	Science Elective **.....	3
	Free Elective.....	3
PE 300	Principles of Physical Conditioning.....	1
	AS, MS, or NS.....	2
TOTAL		18

FIRST (SENIOR) CLASS

First Semester

	Subject	Semester Hrs. Credit
PS 401	Cognition.....	3
PS 403W	Independent Project.....	3
	Free Elective.....	3
	Free Elective.....	3
	English (EN) or Writing (WR) Elective.....	3
	Elective (PE).....	1/2
	AS, MS, or NS.....	2
TOTAL		17 1/2

Second Semester

	Subject	Semester Hrs. Credit
PS 404	History and Systems.....	3
	English (EN) or Writing (WR) Elective.....	3
	Free Elective.....	3
	Free Elective.....	3
	Elective (PE).....	1/2
	AS, MS, or NS.....	2
TOTAL		14 1/2

Total Hours: 136 (includes 39 hours of psychology)

*Minimum Grade of C required.

**Must be taken from: AT, BI, CH, CS, or PY.

SPECIAL PROGRAMS

A MINOR IN LEADERSHIP STUDIES

The Department of Psychology and Philosophy offers an interdisciplinary minor in Leadership Studies.

Requirements: Each cadet seeking the minor must complete successfully 23 hours as follows: all must complete PS 344 (Leadership in Organizations) followed by PS 495 (Independent Project in Leadership) with a grade of C or better. The cadet must have a GPA of 2.0 or better in all coursework for the minor. Four hours of ROTC at the 300 level and four hours of ROTC at the 400 level are required.

Electives: The remaining 9 hours must be selected from the courses listed below from at least three departments.

Economics/Business

BU 220	Principles of Management
BU 322	Human Resource Management
BU 306	International Business
BU 440	Business Policy Seminar

English

WR 340	Writing for the Professions
WR 342	Technical Writing
WR 347	Advanced Composition
EN 376	Literature of War

History

HI 385	U.S. Military History to 1919
HI 386	U.S. Military History since 1919

Physical Education

PE 430	Health Education
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Politics International Studies

IS 340	Political Theory
IS 320	National Security Policy
IS 333	International Studies Seminar

Psychology and Philosophy

PS 302	Social Psychology
PS 306	Human Resource Management
PS 308	Motivation
PH 301	Logic
PH 304	Ethics

Rationale: Through an interdisciplinary curriculum, we seek to develop in each qualified cadet a base of knowledge about leadership and its effective application. The intent of this minor is to allow cadets to enhance their knowledge of the leadership process, while simultaneously increasing effectiveness in leadership and management performance.

INFORMATION TECHNOLOGY AND DESIGN MINOR

The Information Technology and Design minor will produce graduates prepared for a careers influenced strongly by a firm understanding of the role of technology and its place in military, for-profit and not-for-profit career environments. Whatever career field the cadet chooses, this minor will augment their ability to consult, support and implement technological changes in the workplace. VMI graduates with an ITD Minor will possess a strong understanding of the role of technology at many levels and further acquire an understanding of the need for integrating information technology in human endeavors, safely and securely. This program will address the need for liberal arts graduates and others to better understand the scientific as well as human aspects of information technology, both of hardware and software, but especially in the interaction of human and machine. For science and engineering graduates, the development of information technology design and security will better prepare them for implementing information management schemes in their chosen field. For more information on the ITD Minor, please see LTC Siemers, Department Chair or COL Gluck of the Mathematics and Computer Science Department, 436 Mallory Hall.

TEACHER CERTIFICATION

(Academic Special Program Under the Dean of the Faculty)

VMI currently offers a teacher certification program in secondary education through a consortium agreement with Mary Baldwin College and Washington and Lee University. The teacher program provides cadets with the courses they need to: 1) obtain licensure in the state of Virginia, 2) work toward licensure in another state, or 3) gain credentials for teaching in private secondary schools.

Application Procedure:

Cadets wishing to apply for the program must submit an application to the Director of Teacher Certification, Colonel Holly Richardson, 332A Cocke Hall. Cadets who are seriously thinking about pursuing licensure are encouraged to apply as early as the second semester of their fourth class year. Cadets interested in licensure in a state other than Virginia or who wish to teach in private secondary schools must also complete an application to be eligible to enroll in VMI's education courses.

Candidacy Requirement:

Cadets who wish to be admitted to the teacher certification program must meet and maintain a cumulative 2.5 GPA. Those cadets who do not meet the cumulative 2.5 standard by the end of their fourth class year, may be admitted conditionally by the Director of Teacher Certification; they must, however, achieve a 2.5 cumulative GPA by the end of the first semester of their second class year in order to continue in the program.

Those cadets pursuing licensure in Virginia must also meet the following:

1. Graduation from VMI in an appropriate major discipline.
2. Successful completion of all teacher-certification courses with a 3.0 GPA.
3. Completion of 12 semester hours of student teaching. This requires full-time teaching for one semester under the supervision of a master teacher in the public schools. Because of the demands of most VMI majors, this requirement may need to be completed after graduation from VMI through the adult degree program at Mary Baldwin College.
4. Successful completion of the State Licensure Examination.

Course Requirements

The following courses are required for licensure in Virginia. Those cadets who are pursuing licensure in another state or who wish to teach in private schools should consult with the Director of Teacher Certification to design a program that includes appropriate courses from the listing below.

ED 200	Foundations of Education	3
ED 210	Practicum in Education	3
ED 302	Understanding Exceptional Individuals.....	3
ED 303	Teaching and Learning in the Content Areas	3
ED 401	Secondary Methods and Practicum	4
ED 402	Student Teaching and Seminar	15
PS 307	Developmental Psychology	3

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.

The fields of study, with the abbreviations by which they are identified, are:

AR	—	Arabic
AS	—	Aerospace Studies
AT	—	Astronomy
BI	—	Biology
BC	—	Biochemistry
BU	—	Business
CH	—	Chemistry
CE	—	Civil Engineering
CS	—	Computer Science
EC	—	Economics
ED	—	Education
EE	—	Electrical Engineering
EL	—	Environmental Leadership
EN	—	English
FA	—	Fine Arts
FR	—	French
GE	—	Geology
GR	—	German
HI	—	History
HN	—	Honors
HNL	—	Honors - Liberal Arts
HNS	—	Honors - Science/Engineering
IS	—	International Studies
ITD	—	Information Technology & Design
JP	—	Japanese
LS	—	Leadership Studies
MA	—	Mathematics
ME	—	Mechanical Engineering
MS	—	Military Science
MU	—	Music
NS	—	Naval Science
PE	—	Physical Education
PH	—	Philosophy
PS	—	Psychology
PY	—	Physics
SE	—	Speech
SP	—	Spanish
SS	—	Science and Security

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.

DEPARTMENT OF AEROSPACE STUDIES

Colonel Miller (Head); Captains Floyd, Jackson Kennedy and Whitehead.

AS 103 and AS 104. THE AIR FORCE TODAY 1—0—1

Introduces students to the USAF and AFROTC. Topics include: mission and organization, Air Force heritage, officership and professionalism, military customs and courtesies, Air Force officer opportunities, and communication skills.

AS 203 and AS 204. THE EVOLUTION OF USAF AIR AND SPACE POWER 1—0—1

Examines air and space power through a historical perspective in addition to fundamental truths associated with war in the third dimension. Additionally, cadets will continue to learn Air Force core values and communication skills.

AS 213 and AS 214. AIR FORCE LAB FOR AS203 and 204 0—1—0

Prepares cadets pursuing an Air Force commission for AFROTC Summer Field Training.

AS 303 and AS 304. AIR FORCE LEADERSHIP AND MANAGEMENT 2—0—2

Emphasizes the concepts and skills required by the successful manager and leader. Includes individual motivational and behavioral processes, leadership, communication, and group dynamics, which provide the foundation for developing the junior officer's professional and officership skills. The fundamentals of management, emphasizing decision making, the use of analytic aids in planning, organizing, and controlling in a changing environment are included. Organizational and personal values (ethics), management of change, organizational power, politics, and managerial strategy and tactics are discussed within the context of the military organization. These courses must be taken with appropriate leadership laboratories.

AS 313 and AS 314. LEADERSHIP LAB FOR AS 303 and AS 304 0—1.5—0

Leadership laboratory activities include experiences in officer-type activities. Military briefings and Air Force case studies are used to help students apply the leadership and management principles of this course. (Cadets who are not seeking a commission must attend LS 350 and LS 351.) These labs must be taken concurrently with the appropriate lecture course. These courses must be taken with appropriate leadership laboratories.

AS 403 and AS 404. NATIONAL SECURITY AFFAIRS AND PREPARATION FOR ACTIVE DUTY 2—0—2

Examines the formulation, organization, and implementation of national security policy; evolution of strategy; management of conflict; and civil-military interaction. Includes blocks of instruction on the military profession, officership, and the military justice system. Provides future Air Force officers with a background of United States National Security Policy so they can effectively function in today's Air Force. These courses must be taken with appropriate leadership laboratories.

AS 413 and AS 414. LEADERSHIP LAB FOR AS 403 and AS 404 0—1.5—0

Leadership laboratory activities include advanced leadership experiences in officer-type activities and orientation for initial active duty. (Cadets who are not seeking a commission must attend LS 450 and LS 451.) These labs must be taken concurrently with the appropriate lecture course.

ARABIC

(See Department of Modern Languages, page 100.)

ASTRONOMY

(Under Administrative Supervision of Department of Physics and Astronomy) Colonel Thompson. See page 105.

DEPARTMENT OF BIOLOGY

Colonels Turner (Head), Baur, Bell and Rowe ; Majors Lilly, Moosman, Alerding and deHart.

Requirements for major in biology are specified on page 34.

BI 101. INTRODUCTORY BIOLOGY I 3—3—4

The primary goal of this course is to present basic biological concepts in the context of human biology and thus providing the student with a basis for understanding how their bodies work. Concepts of biology will be explored as they pertain to human circumstances, including relevant ethical debates and current events. Lecture material will cover topics beginning with the chemistry of life and continuing through the various systems of the human body. Laboratory topics will include use of the scientific method as well as activities reinforcing lecture material and discussions of ethical issues and current events. This course in conjunction with BI 102 satisfies the Core Curriculum Science Requirement.

BI 102. INTRODUCTORY BIOLOGY II 3—3—4

The primary goal of this course is to present basic biological concepts in the context of human biology and thus providing the student with a basis for understanding how their

bodies work. Concepts of biology will be explored as they pertain to human circumstances, including relevant ethical debates and current events. This is a continuation of BI 101. Lecture material will cover several systems of the human body, cell division and gamete formation, and introductions to genetics and evolution. Laboratory topics will include activities that reinforce lecture material as well as a project where students will develop and participate in bioethical debates. This course in conjunction with BI 101 satisfies the Core Curriculum Science Requirement.

BI 103. PRINCIPLES OF BIOLOGY AND RESEARCH I 1—0—2

This course introduces first-semester biology majors to the process of conducting biological research with an emphasis on model animal and plant systems. Current issues in ecology and organismal biology will be explored using case studies and the scientific method, while focusing on literature review, experimental design, data analysis, interpretation and communication of results. This course is restricted to biology majors only.

BI 104. PRINCIPLES OF BIOLOGY AND RESEARCH II 1—0—2

Second-semester biology majors will continue their hands-on approach to conducting biological research using the scientific method. More detailed approaches to the development of problem solving skills will be pursued as students learn how all biological disciplines are tied together by evolutionary principles. This course is restricted to biology majors only.

BI 192 and BI 193. INDEPENDENT RESEARCH 0—4—2 to 0—6—3

These courses are for rising third classmen pursuing research during the summer. Permission of instructor and department head required.

BI 201. BIostatistics 3—0—3

An introduction to the analysis, interpretation, and presentation of data acquired from biological research. This applied statistics course will help students develop an understanding of descriptive statistics, probability theory, statistical inference, and hypothesis testing by working with real data. The emphasis will be on application rather than theory. Statistical tests that will be covered include: t-tests, Chi-square, regression, analysis of variance, and nonparametric. Prerequisites: BI 101 and BI 102.

BI 204. PHYSIOLOGY 3—3—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. Prerequisites: BI 101 and BI 102.

BI 205. GENETICS 3—3—4

An introductory study in genetics beginning with the work of Mendel and progressing through modern molecular techniques. Emphasis will be placed on understanding the flow of biologic information from DNA to proteins and the mechanisms of genetic change. The laboratory component includes experiments in karyotyping, gene transfer, restriction digest of DNA, DNA fingerprinting, and PCR, as well as crosses with fruit flies and plants. Prerequisites: Proficiency in BI 101 and BI 102.

BI 215. NUTRITION 3—0—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. No prerequisites.

BI 216. ANIMAL BEHAVIOR 3—0—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. Students will design and conduct a research project and present their projects to the class. Prerequisites: BI 101, 102, or permission of the instructor.

BI 217. GENERAL BOTANY 3—3—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. Prerequisites: BI 101 and BI 102.

BI 218. BIOLOGY OF GENDER 3—0—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.

- BI 219. CONSERVATION BIOLOGY** 3—3—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. Prerequisites: BI 101 and BI 102.
- BI 240. BIOLOGICAL AGENTS IN WARFARE AND TERRORISM** 3—0—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.
- BI 245X. EPIDEMICS AND SOCIETY** 3—0—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. Civilizations and Cultures (X).
- BI 290 and BI 291. INDEPENDENT RESEARCH** 0—4—2 to 0—6—3
These courses are for third classmen pursuing research during the fall and/or spring semesters. Permission of instructor and department head required.
- BI 292 and BI 293. INDEPENDENT RESEARCH** 0—4—2 to 0—8—4
These courses are for rising second classmen pursuing research during the summer. Permission of instructor and department head required.
- BI 303. DEVELOPMENTAL BIOLOGY** 3—3—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. Prerequisites: BI 101 and BI 102.
- BI 304. COMPARATIVE VERTEBRATE MORPHOLOGY** 3—3—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. When offered BI 304 may serve as a substitution for or addition to BI 303 Developmental Biology. Prerequisites: BI 101 and BI 102.
- BI 311. AQUATIC ECOSYSTEMS** 3—3—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. Prerequisites: BI 101 and BI 102.
- BI 312. ECOLOGY** 3—3—4
The course is designed to show the interaction and interdependence of all organisms in the biological community. The basic principles of ecology, illustrating how living organisms develop communities. Prerequisites: BI 101 and BI 102.
- BI 313. MICROBIOLOGY** 3—3—4
A survey of the biology of microorganisms encompassing their diversity, structure, metabolism, pathogenesis, and ecology. A primary focus will be on medical and veterinary pathogens, including viruses, and the molecular basis of disease. Laboratory exercises will cover identification and manipulation of bacteria and single-celled eukaryotes. Prerequisites: BI 101 and BI 102.
- BI 316. MAMMALOLOGY** 3—3—4
This course examines the evolutionary origins of mammals within the context of other vertebrate lineages, and surveys the anatomy, natural history, ecology, and conservation of the major groups of mammals. Laboratory focuses on techniques used to study mammals, including capture and handling techniques, specimen preparation and curation, and identification of skeletal material and study skins, with emphasis on the mammals of Virginia. Prerequisites: BI 101 and BI 102.
- BI 317. HERPETOLOGY** 3—3—4
This course examines the evolutionary origins of reptiles and amphibians within the context of other vertebrate lineages, and surveys the anatomy, natural history, ecology, and conservation of the major groups. Laboratory focuses on studying anatomy, observing reptiles and amphibians in the field, capture and handling techniques, and identification of native specimens, with emphasis on reptiles and amphibians of Virginia. Cadets will be required to keep field notes and compile a collection of photographic specimens. Prerequisites: BI 101 and BI 102.
- BI 321. INVERTEBRATE ZOOLOGY** 3—3—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 effect 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. Prerequisites: BI 101 and BI 102.
- BI 322. PLANT PHYSIOLOGY** 3—3—4
This course explores physiological mechanisms that plants use to acquire resources, grow and develop, and defend against enemy attack. Class discussions include critical evaluation of research literature. Lab experiments introduce students to current physiological, biochemical, and molecular tools, culminating in an original research project. Prerequisites: BI 101 and BI 102.
- BI 323. EXERCISE PHYSIOLOGY** 3—3—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. Prerequisites: BI 101 and 102 or permission of instructor.
- BI 324. ORNITHOLOGY** 3—3—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. Prerequisites: BI 101 and BI 102; BI 216 highly recommended.
- BI 331WX. CULTURAL, ETHICAL, ECONOMIC, RELIGIOUS, AND POLITICAL ISSUES SURROUNDING SCIENCE AND MEDICINE** 3—0—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. Writing intensive (W) Civilizations and Cultures (X).
- BI 335. NEUROBIOLOGY** 3—3—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. Prerequisites: BI 101 and BI 102.
- BI 351 and 352. SELECTED TOPICS IN BIOLOGY** 2—0—2 to 3—3—4
Selected topics to be discussed by faculty or visiting professors. Topics will be determined upon adequate student interest. This course will not necessarily be offered each academic year.
- BI 353W SUMMER SCHOLARS PROGRAM I** 0—8—4
BI 354W SUMMER SCHOLARS PROGRAM II 0—8—4
The Summer Scholars Program is divided into a seminar course and 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 the seminar portion of the course throughout the summer. Permission of department head, only.
- BI 390 and BI 391. INDEPENDENT RESEARCH** 0—4—2 to 0—8—4
These courses are for second classmen pursuing research during the fall and/or spring semesters. Permission of instructor and department head required.
- BI 392W and BI 393W. INDEPENDENT RESEARCH** 0—4—2 to 0—8—4
These courses are for rising first classmen pursuing research during the summer. Permission of instructor and department head required.
- BI 401. SENIOR HONORS THESIS** 0—6—0
BI 402. SENIOR HONORS THESIS 0—6—0
Only senior biology majors who are enrolled in the Institute Honors Program may apply. During the first class year, the cadet will be expected to complete an honors thesis with the criteria, scope, and management of the thesis determined by the department.

BI 404. CELL BIOLOGY 3—3—4
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. Prerequisites: CH 223, BI 101, and BI 102.

BI 405. HISTOLOGY 3—3—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. Histology will be offered on an every other year basis. Prerequisites: BI 101 and BI 102.

BI 410. EVOLUTIONARY BIOLOGY 3—0—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. Prerequisites: BI 101 and BI 102.

BI 411. IMMUNOLOGY 3—0—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 immunopathologies will also be discussed. Prerequisites: BI 101, BI 102, and BI 204 or BI 302.

BI 420W. BIOLOGY SEMINAR 3—0—3
This course is required of all biology majors and is a writing intensive course. The course will follow a seminar format and the topics covered will be drawn from a broad range of areas in biology and will emphasize current developments in these areas. Cadets will lead discussions and write summaries for the topic they present. A term paper will be written on a specific area of interest in biology. Prerequisites: Completion of at least one course from each of the four areas and first-class status. Writing Intensive (W).

BI 430. MOLECULAR BIOLOGY 3—0—3
Pre: BI 101, CH/224/225 (Organic), BC (CH) 421/422, BI 205 (Genetics) or BI 302 (Cell Biology)

BI 490W and BI 491W. INDEPENDENT RESEARCH 0—4—2 to 0—8—4
These courses are for first classmen pursuing research during the fall and/or spring semesters. Permission of instructor and department head required.

DEPARTMENT OF CHEMISTRY

Colonels Jones, Pharr, and Schreiber; Lieutenant Colonels Cain, Smith, Timmons (Head); Major McCain; Drs. Hinks, Raymond, Mrs. Smith and McCain and Mr. Christiansen. Requirements for a major in chemistry are specified on pages 40.

Prerequisites: Proficiency in CH 131 and 132 or in CH 137 and 138 for all courses in chemistry numbered 223 or higher. Additional prerequisites are stated in descriptions of courses below.

CH 111. LABORATORY FOR CH 131 0—3—1
A laboratory course designed to reinforce the concepts covered in CH 131. Corequisite: CH 131.

CH 112. LABORATORY FOR CH 132 0—3—1
A laboratory course designed to reinforce the concepts covered in CH 132. Prerequisites: CH 111 and CH 131. Corequisite: CH 132.

CH 117. LABORATORY FOR CH 137 0—3—1
Experiments designed to demonstrate the basic principles of chemistry with respect to observations, measurements, and calculations. Corequisite: CH 137.

CH 118. LABORATORY FOR CH 138 0—3—1
A continuation of CH 117. Emphasis is placed upon proper procedures in chemical syntheses and analyses. Prerequisites: CH 117 and CH 137. Corequisite: CH 138.

CH 125. LABORATORY FOR CH 137* 0—5—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: CH 137, for CH majors only*.

CH 126. LABORATORY FOR CH 138* 0—5—2
A continuation of CH 125, including both qualitative and quantitative analyses. The laboratory will also be an introduction to research philosophies in chemistry. Prerequisites: CH 125 and CH 137. Corequisite: CH 138, for CH majors only*.

CH 131. CHEMICAL SCIENCE I 3—0—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: CH 111.

CH 132. CHEMICAL SCIENCE II 3—0—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. Prerequisites: CH 131 or CH 137 and CH 111 or CH 117. Corequisite: CH 112.

CH 137. INTRODUCTORY COLLEGE CHEMISTRY I 3—0—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: CH 117 or CH 125.

CH 138. INTRODUCTORY COLLEGE CHEMISTRY II 3—0—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: CH 137. Corequisite: CH 118 or CH 126.

CH 223. ORGANIC CHEMISTRY I 3—0—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: CH 138 or its equivalent.

CH 224. ORGANIC CHEMISTRY II 3—0—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: CH 223 with minimum grade of C.

CH 225. ORGANIC LABORATORY I 0—3—1.5
A laboratory which emphasizes scientific observation and communication, while introducing the use of modern analytical techniques such as thin layer, vapor phase, and column chromatography. Corequisite: CH 223.

CH 226. ORGANIC LABORATORY II 0—3—1.5
A laboratory course that includes mechanistic studies and synthetic problems, and employs instrumental techniques to determine the purity and structure of reaction products. Prerequisite: CH 225. Corequisite CH 224.

CH 229. ORGANIC LABORATORY I FOR NON-MAJORS 0—3—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. Pre-requisite: CH 223.

CH 230. ORGANIC LABORATORY II FOR NON-MAJORS 0—3—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: CH 224 and CH 227.

CH 246. INORGANIC CHEMISTRY 3—0—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 262. PUBLIC HEALTH ISSUES 3—0—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. Prerequisites: One of the following: CH 131, CH 137, BI 101 or by instructor approval.

CH 301. PHYSICAL CHEMISTRY I 3—0—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. Prerequisites: MA 116.

CH 302. PHYSICAL CHEMISTRY II 3—0—3
A continuation of CH 301 with emphasis on chemical kinetics, equilibria, phase equilibria, solutions, electrochemistry, and quantum mechanics. Prerequisites: MA 201 and PY 207.

CH 311W. LABORATORY FOR CH 301 0—3—1.5
CH 312W. LABORATORY FOR CH 302 0—3—1.5
Laboratory exercises which illustrate physical chemistry principles and laboratory techniques. Corequisites: CH 301 for CH 311 and CH 302 for CH 312.

CH 321. STRUCTURAL BIOCHEMISTRY 3—0—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 (BC 323). Prerequisites: CH 224.

CH 323 LABORATORY FOR CH 321 0—3—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: CH 224.

CH 322. METABOLIC BIOCHEMISTRY 3—0—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.

CH 335. ANALYTICAL CHEMISTRY I 3—0—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 CH 337.

CH 336. ANALYTICAL CHEMISTRY II 3—0—3
A continuation of CH 305 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. Prerequisites CH 301 and CH 335. Corequisite CH 302 and CH 338.

CH 337. LABORATORY FOR CH 335 0—3—1.5
Laboratory component for CH 335 emphasizing laboratory technique while illustrating analytical principles.

CH 338. LABORATORY FOR CH 336 0—3—1.5
The laboratory component for CH 336 featuring hands-on use of instruments, sample preparation and data interpretation.

CH 362. TEACHING MENTORSHIP IN CHEMISTRY 2—3—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 255-256. SUMMER RESEARCH IN CHEMISTRY No Credit
CH 355-356. SUMMER RESEARCH IN CHEMISTRY No Credit
CH 455-456. SUMMER RESEARCH IN CHEMISTRY No Credit
Independent study opportunities, offered in each summer session, for students participating in chemical research under faculty supervision. Prerequisites: permission of department head and faculty research adviser.

CH 359. RESEARCH TOPICS IN CHEMISTRY 0—4—2

CH 401. ADVANCED TOPICS IN CHEMISTRY 3—0—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 360. RESEARCH TOPICS IN CHEMISTRY 0—4—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 357-358. INDEPENDENT SUMMER RESEARCH 0—2—1 to 0—8—4
CH 457-458. INDEPENDENT SUMMER RESEARCH 0—2—1 to 0—8—4
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 four credit hours per summer session. An oral presentation and a comprehensive written research paper are required for each course. Prerequisites: permission of department head and faculty research supervisor.

CH 396X. CHEMISTRY IN A HISTORICAL CONTEXT 0—3—1.5
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. Prerequisite two semesters of General Chemistry.

CH 425. QUALITATIVE ORGANIC ANALYSIS 2—0—2
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. Prerequisites: CH 223, CH 224, CH 301, and CH 302. Corequisite: CH 427.

CH 426. ADVANCED ORGANIC CHEMISTRY 3—0—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. Prerequisites: CH 223, CH 301, and CH 302.

CH 434. CHEMICAL SYNTHESIS 0—4—2
A laboratory course involving the synthesis and characterization of selected inorganic and organic compounds.

CH 444. ADVANCED INORGANIC CHEMISTRY 3—0—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 0—4—2 to 0—6—3
CH 452. SENIOR THESIS 0—4—2 to 0—6—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 461-464. SELECTED TOPICS IN CHEMISTRY 3—0—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. Prerequisites: The core chemistry courses.

CH 466. POLYMER CHEMISTRY 3—0—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. Prerequisites: Both CH 224 and CH 302 or instructor approval.

CH 467. THEORETICAL CHEMISTRY 3—0—3
Concepts in quantum chemistry, molecular symmetry and spectroscopy, statistical thermodynamics, and superconductivity are related to contemporary ideas in physical chemistry. Prerequisites: CH 301 and 302.

DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

Captain Riester (Head), Colonels Mullen and Rogers; W. Evans (Stanley Chair) and Majors Idewu, Johnstone and Newhouse.
Requirements for a major in civil engineering are specified on pages 43.

CE 104. CE DRAWING 2—0—2
Engineering mechanical drawing and computer-aided drafting with applications to CE. Topics include technical sketching and shape description, orthographics, isometrics, and dimensioning.

CE 105. INTRODUCTION TO CIVIL ENGINEERING 0—2—1
An introduction to the civil engineering profession providing an overview of its history, specialty areas, responsibilities, and importance to the civilian infrastructure. Engineering computations, presentation of results, and elementary design projects are covered.

- CE 121. SURVEYING** 2—3—3
Surveying instruments, measurements of horizontal and vertical distances and direction, traverse computations, topographic mapping, and construction surveys. Corequisite CE 104.
- CE 123. ENGINEERING CALCULATION TOOLS** 2—0—2
The use of spreadsheets and MathCAD for calculus and civil engineering computations including root finding, solutions to systems of linear equations, optimization, statistics, numerical integration and differentiation, and error analysis. Corequisite: MA 123.
- CE 206. SOLID MECHANICS** 3—0—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, energy methods, generalized stress and strain relationships, and buckling theory. Prerequisites: MA 124 and C or better in ME 201.
- CE 208X. INTRODUCTION TO GEOGRAPHIC INFORMATION SYSTEMS (GIS)** 3—0—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 offered as a Civilizations and Cultures (C&C) Course and is open to all majors. Civilizations and Cultures (X).
- CE 214. CIVIL ENGINEERING METHODS WITH PROBABILITY AND STATISTICS** 3—0—3
Numerical methods applied to matrix manipulations and elimination techniques, and to linear programming. Review of probability and statistics to include discrete and continuous random variables, probability and cumulative density functions, central tendency, variability, skew, probability rules, and permutations and combinations. Application of probability distribution functions and confidence intervals and hypothesis testing, curve fitting including general linear least squares regression and linear regression, goodness of fits; and linear transforms, and interpolation to civil engineering practice. Computer spreadsheet applications. Prerequisite: CE 123.
- CE 301. STRUCTURAL THEORY** 3—0—3
Analysis of statically determinate and indeterminate structures. Application of computers to structural analysis. Prerequisites: C or better in CE 206 and MA 215.
- CE 302. CIVIL ENGINEERING DYNAMICS** 3—0—3
Vibration theory for discrete and continuous linear systems. Analysis of the free response of damped and undamped systems and forced response for harmonic, impulse, and base excitation in single and multiple degree of freedom systems. Computer analysis of structures and foundations. Prerequisites: MA 311, C or better in CE 301.
- CE 307. PROPERTIES OF ENGINEERING MATERIALS** 2—3—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: C or better in CE 206.
- CE 309. FLUID MECHANICS** 3—0—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. Prerequisites: C or better in ME 201.
- CE 310. SOIL MECHANICS** 3—3—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: C or better in CE 206.
- CE 321 ENVIRONMENTAL ENGINEERING** 3—0—3
Environmental engineering aspects of pollution control including a review of environmental chemistry; water/wastewater and industrial waste characteristics; pertinent environmental regulations; reactor engineering and wastewater treatment; municipal and industrial wastewater treatment plant design; and a review of risk assessment.
- CE 322W. WATER RESOURCES ENGINEERING** 3—3—4
Occurrence and movement of surface water flow, analysis of hydraulic problems associated with the design of civil engineering structures, analysis and design of public water supply systems, and related topics. Includes laboratory procedures and statistical analysis of experimental data, examination of fluid properties and topics in fluid mechanics and hydraulic engineering, experimental topics in water resources and environmental engineering, and analysis and design of water distribution systems. Designated as a writing intensive course. Prerequisites: CE 309 and CE 321. Writing Intensive (W).
- CE 327. REINFORCED CONCRETE DESIGN** 3—0—3
Design of reinforced concrete members by ultimate strength methods. Computer applications. Prerequisite: CE 301.
- CE 333. TRANSPORTATION ENGINEERING** 3—0—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: CE 202.
- CE 350. CIVIL ENGINEERING PROJECT MANAGEMENT** 3—0—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** 3—0—3
The course addresses the 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: CE 322.
- CE 402. STRUCTURAL MECHANICS** 3—0—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. Prerequisites: a C or better in CE 206 and CE 301.
- CE 403. FOUNDATIONS** 2—3—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: CE 310.
- CE 404. ADVANCED MECHANICS OF FLUIDS** 3—0—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: CE 309 or permission of the instructor.
- CE 405. WOOD ENGINEERING** 3—0—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. Prerequisites: CE 206 and CE 301.
- CE 406. PRINCIPLES OF CONTAMINANT HYDROGEOLOGY** 3—0—3
Review elements of contaminant releases to soil and groundwater systems including regulatory issues, site reconnaissance and subsurface exploration, groundwater geology, groundwater monitoring, aquifer testing and analysis, solute transport and retardation and attenuation, NAPL transport, transformation and fate, and site remediation. Prerequisites: CE 310.
- CE 408. HYDRAULIC ENGINEERING** 3—0—3
Analysis of hydraulics problems associated with the design of civil engineering structures. Non-uniform, steady flow in open channels; hydraulic models and analogies; design problems for dams, spillways, and gates; hydraulic machinery and other related topics. Application of electronic computers. Prerequisite: CE 322.
- CE 412. ENVIRONMENTAL ENGINEERING CHEMISTRY** 3—0—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** 2—3—3
Design and analysis of biological, physical, and chemical processes for treatment of liquid and solid municipal and industrial wastes. Practical applications are emphasized. Prerequisite: CE 321.
- CE 423. STRUCTURAL STEEL DESIGN** 3—0—3
Structural steel design: beams, columns, trusses, frames, and connections using design codes and specifications. Prerequisite: a C or better in CE 206 and CE 301.
- CE 428. TOPICS IN STRUCTURAL DESIGN** 3—0—3
Analysis and design of structural systems in reinforced concrete, pre-stressed concrete, steel, aluminum, or timber. Computer applications. Prerequisite: a C or better in CE 206 and CE 301.

CE 429. ADVANCED STRUCTURAL THEORY 3—0—3
Analysis of structures by the matrix force and displacement methods. Use of digital computers in structural analysis. Prerequisite: a C or better in CE 206 and CE 301.

CE 436. TRANSPORTATION PLANNING AND DESIGN 3—0—3
The highway transportation modeling process and the relationship of accessibility and urban development highway designs using the computer to generate data, to prepare reports, and to forecast future urban development patterns. Prerequisite: CE 333.

CE 437. CONSTRUCTION METHODS AND MANAGEMENT 3—0—3
Applications of civil engineering principles to realistic construction engineering projects using a team approach. Topics include soil erosion and sediment control, excavation and backfill, dewatering, rock excavation, concrete work, concrete formwork design, heavy equipment production, geosynthetics, trenchless technology, compressed air systems, and cost estimates. Prerequisite: CE 350.

CE 442. CONSTRUCTION ENGINEERING DESIGN 3—0—3
Comprehensive planning and scheduling of a large construction project. Prerequisite: First Class standing or permission of instructor.

CE 443. INDEPENDENT RESEARCH 0—6—3
For cadets engaged in research projects under faculty supervision. Prerequisite: Permission of department head and faculty research adviser.

CE 444. STRUCTURAL ENGINEERING DESIGN 3—0—3
Application of civil engineering principles to comprehensive engineering problems in the structural area. Planning and design of realistic projects. Prerequisite: First class standing or permission of instructor; grade of C or higher in both CE 206 and CE 301.

CE 446. ENVIRONMENTAL ENGINEERING DESIGN 3—0—3
Application of civil engineering principles to comprehensive engineering problems in the environmental area. Planning and design of realistic projects. Prerequisite: First class standing or permission of instructor.

CE 448. CIVIL ENGINEERING DESIGN 3—0—3
Application of civil engineering principles to comprehensive engineering problems. Planning and design of realistic projects. Prerequisite: First class standing or permission of instructor.

CE 451. CIVIL ENGINEERING SEMINAR 1—0—1
Seminars on topics of professional interest. Prerequisite: First class standing or permission of instructor.

CE 270-279, CE 370-379, CE 470-479. TOPICS IN CIVIL ENGINEERING 3—0—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. Not necessarily offered each year. Prerequisite: Permission of instructor.

CE 461. INDEPENDENT SUMMER RESEARCH 0—2—1 to 0—6—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. Prerequisites: Permission of department head and faculty research adviser.

COMPUTER SCIENCE

(Under Administrative Supervision of the Department of Mathematics and Computer Science)
Requirements for a degree in computer science are specified on page 47.

CS 121. PROGRAMMING I 2—2—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.

CS 122. PROGRAMMING II 3—0—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. Includes unit on ethics and professionalism in computer science. Prerequisite: C or better in CS 121.

CS 201. CONTEMPORARY COMPUTER CONCEPTS 3—0—3
This course provides software experiences leading to enhanced mastery in the use of popular computer packages. It also includes topics related to functioning of computers and peripheral devices. Hands-on assignments involve projects using multiple products chosen based on the interests of students and faculty. Typical product explorations include components of Microsoft Office and advanced web searching techniques. Ethics and responsibility associated with computer use are also discussed. Non-credit course for computer science majors.

CS 221. DISCRETE MATHEMATICS 3—0—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.

CS 222. DISCRETE STRUCTURES 3—0—3
Recurrence Relations, Equivalence Relations, Partial Orderings, Graphs, Trees, Boolean Algebra, Modeling Computation. Prerequisite: C or better in CS 221.

CS 316. COMPUTER SYSTEMS 3—0—3
Computer architecture; assembly and machine code; peripheral devices; interfacing and subroutines. Project work will include oral and written presentations. Prerequisite: C or better in CS 122.

CS 326. DATA STRUCTURES 3—0—3
Mathematical models of linear data structures, trees, directed graphs, networks, and computer implementations of such models. Prerequisite: C or better in CS 122 and CS 221.

CS 327. NETWORK COMPUTING 3—2—4
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. Prerequisite: C or better in CS 122.

CS 340. C PROGRAMMING 3—0—3
An introduction to programming concepts and fundamental data types using the C programming language. Dynamic memory allocation, I/O, standard libraries, and common data structures.

CS 345. SOFTWARE ENGINEERING 3—0—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. Prerequisite: CS 326.

CS 346. HUMAN COMPUTER INTERACTION 3—0—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. Prerequisites: C or better in CS 122 and CS 221.

CS 347. WEB APPLICATION DEVELOPMENT 3—0—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, CGI programming, widely-used scripting languages such as JavaScript and Perl, and XML/XSL. Prerequisite: C or better in CS 122.

CS 348. DATABASE AND INFORMATION RETRIEVAL 3—0—3
Introduction to 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. Hands-on experience with a SQL-type relational system. Prerequisite: C or better in CS 122 or equivalent.

CS 411. ALGORITHMS 3—0—3
Algorithms for unordered and ordered sets, matrices, graphs, and trees; string processing; pattern matching. Sorting and searching; recursion. Divide-and-conquer and backtracking; dynamic programming; NP-completeness; intractability and heuristics. Prerequisite: CS 326.

CS 412. INTRODUCTION TO OPERATING SYSTEMS 3—0—3
An introduction to the major concepts of operating systems and their relationship to computer architecture. Topics will include operating systems, concurrency, scheduling and dispatch, memory management, file systems, and security and protection, including ethics and professionalism. Prerequisites: CS 316 and CS 326.

CS 418. IMPLEMENTATION OF PROGRAMMING LANGUAGES 3—0—3
Language features, design principles, implementation; compilers and interpreters; optimization; storage management; runtime considerations; binding times; syntax; semantics; and different programming paradigms. Prerequisite: CS 316 and CS 326.

CS 421. COMPUTER GRAPHICS 3—0—3
Display and input devices, primitives and attributes, transformations, windowing and clipping, segments, projection techniques, hidden line and hidden surface removal, shading methods, user interface, and standards. Prerequisites: MA 305 and CS 326

CS 422. C++ AND OBJECT ORIENTED PROGRAMMING 3—0—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: CS 340.

- CS 430. ARTIFICIAL INTELLIGENCE** 3—0—3
Historical background of AI, knowledge representations and selected topics in search, logic, machine learning, planning, and vision. Discussion of Turing's test for intelligence; programming projects in an appropriate language. Prerequisite: CS 326.
- CS 441. FORMAL LANGUAGES AND AUTOMATA** 3—0—3
Finite-state machines, regular sets, and regular expressions. The Turing machine as recognizer and model for computation; unsolvability. Prerequisite: 30 credit hours in CS coursework or First Class standing.
- CS 451-459. TOPICS IN COMPUTER SCIENCE** 3—0—3
Selected topics in computer science such as genetic algorithms, data communications, and geographic information systems. Prerequisite: Permission of the instructor.

CS 461-469. INDEPENDENT STUDY 1—0—1 to 3—0—3
The Independent study program is designed usually for a cadet in the first or second class, who desires to pursue some special interest in computer science under the supervision of a staff member. A maximum of six semester hours of independent study may be counted toward graduation. Prerequisite: A cumulative GPA of 2.50 or higher, a 3.00 or higher GPA in computer science, and the permission of the head of the Department of Mathematics and Computer Science.

CS 490W. RESEARCH PRACTICUM IN COMPUTER SCIENCE 3—0—3
An undergraduate research experience in computer science under the tutelage of a member of the CS faculty. Projects are agreed to by cadet and faculty member and culminate with an oral presentation and with a publishable (not necessarily published) 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: 30 credit hours in CS coursework or First Class standing. Writing Intensive (W).

DEPARTMENT OF ECONOMICS AND BUSINESS

Colonels Duncan (Head), Basu, Bush, Moreschi, Sen and West; Lieutenant Colonels Allen, Cobb, MacDermott and Smith; Majors Dimitrova-Grajzl, Gerow, Dr. Craig, Mr. McCane, Mr. MacDonald, Mr. Strehpenson and Mrs. Hodges.

Requirements for a major in economics and business are specified on page 49.
*For all economics and business majors, the following courses must be completed with a grade of C or higher: MA 125, 126; WR 101, 102; EC 201, 202, 300, 303, 304, 330; BU 210, 211, 220, 230, 310, 330, 316, 339, 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** 3—0—3
Critical analysis of the behavior of individuals and firms in a market economy. Microeconomic tools of analysis are developed and applied to the problem of resource allocation and the determination of value by consumers and firms. The virtues and limitations of markets are discussed.
- EC 202. *PRINCIPLES OF MACROECONOMICS** 3—0—3
An analytical study of the determination of output, employment, 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.
- EC 220X. THE GLOBAL ECONOMY** 3—0—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. Prerequisites: None. Civilization & Cultures course.
- EC 300. *INTERMEDIATE MICROECONOMICS** 3—0—3
Analysis of the determination of price and output in commodity and factor markets under varying market conditions, the role of prices in the allocation of resources and distribution of income, and the nature of partial and general equilibrium. This is a calculus-based course. Prerequisites: EC 201-202 and MA 126 (or equivalent) all with grade of C or higher.
- EC 303. *STATISTICS** 3—0—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. Prerequisites: MA 125 and MA 126 (or equivalent) all with grade of C or higher.
- EC 304. *ECONOMETRICS** 3—0—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: EC 303 with grade of C or higher.
- EC 306. INTERNATIONAL ECONOMICS** 3—0—3
The theory of international trade and its application to current economic, social and political issues. Prerequisites: EC 201-202.

EC 307. INTERNATIONAL FINANCE 3—0—3
A study of the theory of the macroeconomics of international trade and its application to the study of foreign exchange markets and exchange rate policies. Topics include the prediction of exchange rate movements, the role of international institutions such as the IMF, the World Bank, the European Union and the WTO, and the importance of open economy macroeconomic models. Prerequisites: EC 201 and EC 202 with a C or higher or permission of instructor.

EC 322. ENGINEERING ECONOMY 2—0—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 3—0—3
The study of aggregate economic activity that incorporates the interaction of the labor, money, and goods markets. Extended study of the theories of consumption and investment behavior. Special emphasis on implementation of monetary and fiscal policy as applied to problems of inflation, unemployment, and economic growth. Prerequisites: EC 201-202, and MA 125 and MA 126, (or equivalent) all with a grade of C or higher.

EC 401. DEVELOPMENTAL ECONOMICS 3—0—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. Prerequisites: EC 201-202.

EC 403. PUBLIC FINANCE 3—0—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. Prerequisites: EC 201-202.

EC 404. COMPARATIVE ECONOMIC SYSTEMS 3—0—3
A deeper analysis of the differences in institutions across countries that promote or inhibit economic performance, with an emphasis on incentives. Topics may include: an analysis of centrally-planned and market decision making; the transition of formerly planned economies; privatization and decentralization; the role of legal institutions, and the enforcement of property rights and contracts; differences in customs and traditions, and; the interplay of markets and democratic political institutions. Prerequisites: EC 201-202.

EC 405. MONEY AND BANKING 3—0—3
A study of the money and banking system, with emphasis on monetary and income theories, and the role of monetary policy in economic stability and growth. Prerequisites: EC 201-202.

EC 407. U.S. ECONOMIC HISTORY 3—0—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. Prerequisites: EC 201-202.

EC 408. DEVELOPMENT OF ECONOMIC THOUGHT 3—0—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. Prerequisites: EC 300 and EC 330 or permission of instructor.

EC 409. LABOR ECONOMICS 3—0—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. Prerequisites: EC 201-202, and EC 300, or permission of instructor.

EC 410. GOVERNMENT AND BUSINESS 3—0—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. Prerequisites: EC 201-202, or permission of instructor.

EC 412. MANAGERIAL ECONOMICS 3—0—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: EC 201 and EC 202 with grade of C or higher.

EC 414. APPLIED GAME THEORY 3—0—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. Prerequisites: grade of C or better in EC 201 and 202 or permission of instructor.

EC 415. POLITICAL ECONOMY OF CONFLICT 3—0—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. Prerequisites: EC 201 and 202 with a grade of C or better.

EC 421. QUANTITATIVE APPLICATIONS IN ECON & BUSINESS 3—0—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 for firms competing in the market structures of monopoly, monopolistic competition, and oligopoly. Prerequisite: EC 201, EC 202, and EC 303 with a grade of C or better (or equivalent probability or statistics course), or permission of instructor.

EC 422. INDUSTRIAL ORGANIZATION 3—0—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. Prerequisites: EC 201 and EC 202 with a C or better, and EC 300 (completed or concurrent) or permission of instructor.

EC 430. FINANCIAL MODELING 3—0—3
An introduction to the concepts, methodologies, and applications of spreadsheet and simulation models in finance. Students will be required to use Excel & Crystal Ball, and Excel add-in software package, to design and build financial models for capital budgeting, portfolio allocation, value at-risk, simulation of financial time series, and financial option valuation. Prerequisites: EC 303 and BU 310 with a grade of C or better or permission of instructor.

EC 450-451. TOPICS IN ECONOMICS 3—0—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. Offered as announced. Prerequisite: Permission of Instructor.

EC 460-461. INDEPENDENT RESEARCH IN ECONOMICS 0—2—1 to 0—6—3
Independent research designed for cadets who desire to pursue a research interest in economics under the direction of a faculty member. Prerequisite: An overall GPA of 2.7 and permission of instructor and department head.

EC 470. HONORS RESEARCH IN ECONOMICS 0—2—1 to 0—6—3
Designed for cadets pursuing independent research under the direction of a faculty member leading to departmental honors. Prerequisite: A 3.2 GPA overall and in all economics courses. Permission of instructor, department honors committee, and the department head.

EC 480-481. ECONOMICS INTERNSHIP 0—0—0 to 0—0—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. Prerequisite: a 2.8 GPA overall and in all economics 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 481 or BU 480 and 481, although no more than three hours can count towards graduation.

BUSINESS

BU 210.* FINANCIAL ACCOUNTING 3—0—3
Basic principles and concepts of accounting, recording and reporting transactions, and preparation and interpretation of periodic statements. Emphasis is on the rationale underlying accounting operations. Prerequisite: A grade of C or better in MA 125, MA 126, or equivalent.

BU 211.* MANAGERIAL ACCOUNTING 3—0—3
Analysis and use of both accounting data and periodic statements, operating and capital budgets, costing and control of operations, and various periodic profit-planning designs. Prerequisite: BU 210 with a grade of C or better.

BU 215. FINANCIAL PLANNING 3—0—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. Prerequisite: completion of 6 hours of math at VMI or equivalent. Note: This course cannot be taken by EC/BU majors or business minors as a business elective.

BU 220.* PRINCIPLES OF MANAGEMENT 3—0—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 3—0—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 I 3—0—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: BU 210 with grade of C or higher.

BU 306. INTERNATIONAL BUSINESS 3—0—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: EC 201, 202.

BU 310.* BUSINESS FINANCE 3—0—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: BU 210 with a grade of C or better.

BU 316. LEGAL ENVIRONMENT OF BUSINESS 3—0—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.

BU 320. BUSINESS MARKETING 3—0—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: BU 230.

BU 322. HUMAN RESOURCE MANAGEMENT 3—0—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. **NOTE:** Academic credit will be given for BU 322 or for PS 306, but not for both. Also, PS 306 does not fulfill the Liberal Arts (LA) elective requirements of 3 hours of psychology or philosophy, and will not count as a business elective. Prerequisite: BU 220 with a grade of C or higher.

BU 330. MANAGEMENT INFORMATION SYSTEMS 3—0—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: BU 220.

BU 339. OPERATIONS MANAGEMENT 3—0—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: BU 220 and EC 303.

BU 340. ENTREPRENEURSHIP 3—0—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. BU 340 is integrative and applicative, utilizing concepts from core courses in business and economics. Prerequisite BU 220 or permission of instructor.

BU 411. PRINCIPLES OF INVESTMENT 3—0—3
An introduction to investment in securities. Within the context of the institutional and financial environment, the course offers a practical and theoretical analysis of stocks, bonds, and derivative securities. Emphasis on valuation, risk, market mechanics, security analysis and market efficiency. Prerequisites: BU 310 with a grade of C or higher or permission of instructor.

BU 412. PORTFOLIO MANAGEMENT 3—0—3
A practical and theoretical examination of investment management techniques and capital market theory. Emphasis on the construction and management of equity and fixed income portfolios using passive and active strategies. Portfolio diversification, performance evaluation and investment policy statement development are also studied from the perspective of the manager and the client. Prerequisites: BU 310 with a grade of C or higher or permission of instructor.

BU 413. WEALTH MANAGEMENT 3—0—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: BU 411 or concurrent enrollment.

BU 415. FINANCIAL STATEMENTS ANALYSIS 3—0—3
A critical analysis of financial statement components. Prerequisite: BU 310.

BU 418. BUSINESS LEADERSHIP AND THE CLASSICS 3—0—3
This course covers the concepts and techniques of effective leadership. The classics are used as resources to gain insightful knowledge about ways in which concepts and techniques of leadership work in the business environment. Prerequisite: BU 220.

BU 420. MARKETING MANAGEMENT 3—0—3
Case studies involving marketing and strategy and policies, concepts and practices. Promotion, pricing and marketing computer simulation. Prerequisite: BU 230 with grade of C or higher.

BU 421. SPORTS MARKETING 3—0—3
The purpose of this course is to provide an overview of various aspects of sports marketing. This will include three basic components: 1) the use of sports as a marketing tool for other products, 2) the marketing of sports products, and 3) emerging issues that are relevant for both marketing through sports and the marketing of sports. Prerequisite: BU 230 Principles of Marketing.

BU 422. LABOR AND EMPLOYMENT LAW 3—0—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: BU 220 and BU 316 with a grade of C or higher.

BU 440.* BUSINESS POLICY SEMINAR 3—0—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. Prerequisites: EC 300, EC 303, BU 210, BU 220, BU 230. Corequisite: BU 310.

BU 450-451. TOPICS IN BUSINESS 3—0—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. Offered as announced. Prerequisite: Permission of instructor.

BU 460-461. INDEPENDENT RESEARCH IN BUSINESS 0—2—1 to 0—6—3
Independent research designed for cadets who desire to pursue a research interest in business under the direction of a faculty member. Prerequisite: An overall GPA of 2.7 and permission of instructor and department head.

BU 470. HONORS RESEARCH IN BUSINESS 0—2—1 to 0—6—3
Designed for cadets pursuing independent research under the direction of a faculty member leading to departmental honors. Prerequisite: A 3.2 GPA overall and in all business courses. Permission of instructor, department honors committee, and the department head.

BU 480-481. BUSINESS INTERNSHIP 0—0—0 to 0—0—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 may be awarded for a second internship, under the provisions specified by the department head. Prerequisite: 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 481 or BU 480 and 481, although no more than three hours can count towards graduation.

[†]For all economics and business majors, the following courses must be completed with a grade of C or higher: MA 125, 126; WR 101, 102; EC 201, 202, 300, 303, 304, 330; BU 210, 211, 220, 230, 310, 316, 330, 339, 440. In addition, a minimum grade point average of at least a C must be earned in all department courses.

EDUCATION

See teacher certification, page 75.

ED 200. FOUNDATIONS OF EDUCATION 3—0—3
The goals of this introductory course are the following: (1) acquaint students with the philosophical schools of thought in education and with prominent educators whose contributions have shaped educational theory and practice; (2) provide a historical, social, and economic perspective on the principles of education in the United States; (3) show prospective teachers the role of educational institutions and practices in the social structure of modern American society; (4) enhance students' skills in reading, writing, thinking and

discussing educational issues critically and analytically. Required for teacher certification. Open to other students with permission of the instructor.

ED 210. PRACTICUM IN EDUCATION 1—3—1
This course provides students who are contemplating teaching as a career an opportunity to acquire early and varied experiences in the local area schools. Students may enroll in the course several times until they have earned a total of three credits, the minimum required for teacher licensure. Required for teacher certification. Open to other students with permission of the Director of Teacher Certification.

ED 302. UNDERSTANDING EXCEPTIONAL INDIVIDUALS 3—0—3
This is a general survey course that addresses education for exceptional individuals by focusing on etiology, inclusion, identification, and incidence. The course presents, as well, an overview of the methods used by teachers, administrators, and parents to provide education to exceptional students. Also covered are the major educational issues involved in providing instruction for individuals served by special education services and by programs for the gifted. Consequently, the course examines the educational, social and cultural dimensions of life in American society for individuals with disabilities and for individuals who are gifted. Required for teacher certification. Open to other students with permission of the instructor.

ED 303. TEACHING AND LEARNING IN THE CONTENT AREAS 3—0—3
This is a course specifically for those who wish to teach on the middle or secondary level. The course examines research on instruction in all content areas. Students will have the opportunity to read and critique articles on reading instruction across the curriculum as well as comprehension theory. In addition, the major learning theories of educational psychology will be covered as they relate to the organization of instructional material. Students will design and field test learning activities based on current theories of instruction. Required for teacher certification. Open to other students with permission of instructor.

ED 401. SECONDARY SCHOOL METHODS AND PRACTICUM 3—3—4
Those students seeking licensure to teach at the secondary level take this course to learn how to design methods and materials for secondary education. Through the course, students demonstrate their knowledge and skills in the following areas: setting goals and objectives; unit and lesson planning; varying teaching techniques; managing classrooms; building reading and study skills into the content areas; individualizing instruction; measuring and evaluating learning; selecting teaching materials; using multimedia; developing an effective teaching style; and developing confidence in speaking before students and peers. Observation and participation in area schools provide students with the opportunity to integrate teaching theory with practice. This is a prerequisite for student teaching and is required for teaching certification. Open to other students with permission of the Director of Teacher Certification.

ED 402. STUDENT TEACHING AND SEMINAR 3—25—15
This course is open only to students who are serious candidates for teacher licensure. Students must be accepted in VMI's teacher certification program and have met the prerequisites for student teaching as delineated in the requirements for teacher licensure. This course requires 12 weeks of full-time teaching. Students who are interested in pursuing this option should consult with the Director of Teacher Certification well before the spring semester of their senior year.

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

Colonels Addington (Head), Baker, Barr, Livingston, Smith and Squire.

Requirements for a major in electrical and computer engineering are specified on pages 51-53.

EE 111-115 INTRODUCTORY MODULES IN ELECTRICAL & COMPUTER ENGINEERING 1—0—1

A series of five 1.0 credit-hour modules, each taught by a different ECE faculty member, designed to introduce students to the breadth of the electrical and computer engineering discipline. Modules will stress the expectations and opportunities within the ECE profession, will utilize demonstrations of familiar ECE systems to illustrate fundamental ECE concepts, and will provide ample hands-on training with ECE equipment, including computer hardware and software packages. Through careful course design and progression, ECE topics and training will be reinforced across multiple modules in order to emphasize intra-disciplinary connections and prepare students for future ECE coursework.

EE 122. DC CIRCUITS 3—0—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 PSpice is assumed. In-class laboratory techniques are introduced with a guided design projects. Prerequisites: EE 111-115 or permission of the instructor. MA 123 must be taken before or concurrently with EE 122. ECE majors must complete this course with a grade of C or better.

EE 129. COMBINATIONAL LOGIC CIRCUITS 2—2—3
Introduction to the fundamentals of combinational digital logic circuits. 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. Emphasis is placed on the analysis and synthesis procedures used to design combinational logic systems. A hardware description language such as Verilog and programmable logic devices are used in the laboratory to implement combinational circuits applying methods theoretically developed in the lectures. Prerequisites: EE 111-115 or permission of the instructor. ECE majors must complete this course with a grade of C or better.

EE 223. ELECTRICAL CIRCUIT ANALYSIS 3—2—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: MA 124, C or better in EE 122. Corequisite: MA 311.

EE 225. ELECTROMAGNETIC FIELDS 3—0—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. Prerequisites: MA 215.

EE 228. SEQUENTIAL LOGIC CIRCUITS & DIGITAL SYSTEMS DESIGN 2—2—3

A continuation and extension of the material covered in EE 129 to sequential logic circuits and the integration of the methods and knowledge learned into digital systems design. 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 functions such as registers, counters and shift registers are also covered. Modularity, hierarchical methods, controller/datapath partitioning, and a top-down approach are used to design complex digital systems composed of combinational and sequential logic. A hardware description language such as Verilog and programmable logic devices are used in the laboratory to implement digital systems resulting from the aforementioned design process. Prerequisites: EE 129.

EE 230. SIGNAL AND SYSTEM ANALYSIS 3—0—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: EE 223.

EE 255. ELECTRONICS 3—2—4

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: EE 223.

EE 321X. SYSTEMS DESIGN I 3—0—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 presented.

EE 328. COMPUTER DESIGN 2—2—3

An introduction to the architecture and design of digital computers. Topics include von Neumann and Harvard architectures, central processing units, 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. A hardware description language such as Verilog and programmable logic devices are used in the laboratory to implement the computer subsystems studied in the lecture. Prerequisites: EE 228.

EE 339. MICROCONTROLLERS 3—2—4

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 assembly language programming. The use of C programming for microcontrollers is also considered. 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. Prerequisites: EE 328 or permission from the instructor.

EE 351. ELECTRICAL CIRCUITS AND MACHINES 3—0—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. Prerequisites: MA 124. For non-electrical engineering students.

EE 352. ELECTRONIC DEVICES 2—2—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: EE 351. For non-electrical engineering students.

EE 356. ELECTRONIC APPLICATIONS AND INTERFACING 2—2—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. Basic electromagnetic principles are used to provide methods of grounding and shielding, power supply decoupling, and the termination of transmission lines to minimize the effects of external and internal noise sources. Power switching techniques including transistor switches, h-bridges, and pulse-width modulation are used to interface transducers and various types of actuator. Power supply design is studied using linear regulation approaches and introductory switching methods. Digital-to-analog and analog-to-digital conversions may also be presented. Circuit simulation software is used throughout the course and typical circuit applications are designed, implemented, and tested in the laboratory. Prerequisite: EE 255.

EE 372W. ELECTRONIC COMMUNICATIONS 3—2—4

Principles of electronic digital communications theory and systems including AM, FM, PAM, and PCM. Fourier analysis techniques are developed and broadly applied both in class and in the supporting 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. Prerequisites: EE 230 and EE 356. Writing Intensive (W).

EE 381. AUTOMATIC CONTROL SYSTEMS 2—2—3

Properties of closed loop (feedback) control systems. Analysis of both analog systems (in open and closed loop configurations) using: transfer functions, Mason gain, and state space techniques. Modeling of electromechanical systems (translational and rotating). System design methods using Bode plots, gain and phase margin. Controllability and state variable feedback concepts. Root locus and designs to meet pole placement and time response specifications are stressed. Knowledge of Laplace transforms and matrix algebra is expected. Prerequisites: EE 230, MA 311.

EE 413. MICROELECTRONICS 2—2—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 420. GREEN ENERGY POWER CONDITIONING 2—2—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: EE 255.

EE 422. SYSTEMS DESIGN II 0—3—3

Part two of a capstone course in the methodologies and attributes of systems design. Teams of cadets realize the system that was proposed in part one of the course sequence. Once implemented and tested, the system design is explored in a formal oral presentation to the faculty accompanied by a formal written report. Prerequisite: EE 321.

EE 426. SEMICONDUCTOR DEVICES 2—2—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 3—2—4

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: EE 230.

EE 435. FAULT TOLERANT COMPUTING 2—2—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. Prerequisites: MA 220, EE 339.

EE 445. COMPUTER NETWORKS 2—2—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. Prerequisites: MA 220, EE 372W.

EE 450. BIOMEDICAL SIGNAL PROCESSING AND BIOMECHANICS 2—2—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: EE 431.

EE 455. ELECTRICAL/MECHANICAL DESIGN 2—2—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. Prerequisites: EE 223, EE 339, PY 161.

EE 460. PORTABLE POWER 2—2—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. Prerequisite: EE 356.

EE 469. ECE INTERNSHIP FOR CREDIT 0—0—0 to 0—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 470. SEMINAR 1—0—1

The senior seminar is designed with the twin goals of preparing students to take the Fundamentals of Engineering examination, and provide graduating cadets with important career skills not covered in other courses, including how to interview/negotiate salary, what graduate school offers an engineering career, the role of professional organizations including the IEEE, the importance of P.E. licensure, and how to obtain patents. Students will choose an area from several current fast-hiring branches of electrical engineering, research the field from the view of a prospective hire, and present their findings in a formal written and power point presentation to the class.

EE 471W SYSTEM DESIGN VALIDATION 1—0—1

The objective of this course is to 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. A reflective essay addresses lessons learned from application of a complex systems engineering process that produces both a product and management processes. Prerequisite: EE 422. Writing Intensive (W).

EE 473. SELECTED TOPICS IN ELECTRICAL AND COMPUTER ENGINEERING 3—0—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: Permission of the Instructor.

EE 491-496. UNDERGRADUATE RESEARCH IN ECE 1—0—1 to 0—6—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).

DEPARTMENT OF ENGLISH AND FINE ARTS

Colonels Badgett, Ball, Baragona, Leland, C. McDonald, R. McDonald, Miller (Head), Rachels and Thompson; Lieutenant Colonels Ayau, and Ticen; Commander Hart; Majors Pennington and Santos; Doctors Crowley and Ramirez, Ms. Coleman-Croushorn, Mr. Griffin, and Ms. McKagen.

Requirements for a major in English are specified on page 54.

Note: A minimum grade of C in WR 101 is a prerequisite for WR 102, and a minimum grade of C in WR 102 is a prerequisite for all 200- and 300-level English (EN) and Writing (WR) courses. All 400-level courses have additional prerequisites, which are listed in the course descriptions. These prerequisites may be waived by the department head if there is evidence that the cadet is well prepared for the 400-level course.

EN 201. ENGLISH LITERATURE TO 1750 3—0—3

Beginning with the early Anglo-Saxon tale of heroes and monsters, *Beowulf*, and ending in the eighteenth century with the satiric adventures of Swift's Gulliver, this course looks at the major writers and works of the intervening one thousand years. Writers will include Chaucer, Shakespeare, and Milton. Emphasis is placed not only on individual works but on continuity and tradition in the evolution of British literature.

EN 202. ENGLISH LITERATURE SINCE 1750 3—0—3

Romanticism turned away from the past to explore new relationships between human beings and nature, idealism and experience. Major emphasis will be placed on Blake, Wordsworth, Coleridge, Byron, Shelley, and Keats. The impact of industry and science on the Victorian era will be considered in the poetry of Tennyson, Browning, and Arnold, and in Dickens' novel, *Hard Times*. Finally, we will explore the diversity and experimentation of the twentieth century's poetry, fiction, and drama, including the works of Conrad, Yeats, Woolf, and Eliot.

EN 203. WORLD LITERATURE-THEMATIC FOCUS 3—0—3

This course will introduce students to literature from various world regions and/or cultures using a thematic focus. The focus will be on both the close study of the literature itself and the cultural context through which it arose. See the course schedule for specific themes. This course is not repeatable.

EN 204. WORLD LITERATURE-REGIONAL FOCUS (NOT BRITAIN OR US) 3—0—3

This course will introduce students to literature from a specific region of the world. The focus will be on both the close study of the literature itself and the cultural context through which it arose. See the course schedule for specific regional designations. This course is not repeatable.

EN 209. SURVEY OF AMERICAN LITERATURE 3—0—3

"It's a complex fate, being an American." When Henry James wrote these words, he had in mind certain persistent conflicts in the American mind and imagination. This course is an introduction to the major writers from the Colonial period to the present who have helped to define these conflicts and thus to illuminate the complex fate of this country. The course will consider such things as America's sense of destiny; the tension between individual rights and social imperatives; the encounter of black, red, and white on this continent; the role of the artist in a democratic society; changing perspectives on nature; the old world versus the new; the American dream; and the American nightmare.

EN 250W SEMINAR IN LITERARY RESEARCH & ANALYSIS 3—0—3

This course is an introduction to literary research and writing. It teaches students how to conceive and shape research topics, use a wide range of research tools (both in print and online), and apply a variety of critical theories for reading and analyzing literature. Course research projects will be both instructor-and student-designed. Writing Intensive (W).

EN 308. RENAISSANCE ENGLISH LITERATURE 3—0—3

A study of English poetry, prose, and drama of the sixteenth and early seventeenth centuries. Emphasis is on the understanding and appreciation of the works discussed, but some attention is given to each as an expression of the culture of the period.

EN 310. SHAKESPEARE 3—0—3

A survey of Shakespeare's works, including selected histories, tragedies, and comedies.

EN 312. EIGHTEENTH-CENTURY BRITISH LITERATURE 3—0—3

The literature of the Restoration and eighteenth century in England (1668-1775); *Gulliver's Travels*, *Robinson Crusoe*, *The Beggar's Opera*, and more.

EN 316. ROMANTIC LITERATURE 3—0—3

A study of poetry and prose of the English Romantic Movement. The nature of the individual, the connections among individuals, the nature of nature, the effects of technology and the industrial revolution, and the place and purpose of literature were the concerns of such poets as Blake, Wordsworth, Coleridge, Keats, Byron, and Shelley, and of the novelists Walter Scott and Mary Shelley (*Frankenstein*).

EN 318. VICTORIAN LITERATURE 3—0—3

A study of Victorian thought and spirit through literature. Readings in Bronte, Tennyson, Browning, Wilde, and others.

EN 320. TWENTIETH-CENTURY BRITISH LITERATURE 3—0—3
A study of major British writers since 1900 including Conrad, Eliot, Yeats, and Graham Green, among others.

EN 326. EUROPEAN LITERATURE: 1914 TO THE PRESENT 3—0—3
A study of various authors, typically including Mann, Sartre, Camus, Kafka, and Koestler. Emphasis is on the development of existential and absurdist attitudes and forms, especially as responses to the two World Wars, the emergence of totalitarianism and the Holocaust.

EN 350. AMERICAN PERIOD - EARLY AMERICAN 3—0—3
A study of American literature beginning with the first voyage of Christopher Columbus and concluding with the rise of Washington Irving and James Fenimore Cooper, this course chronicles the efforts of European immigrants and their descendants to discover a distinctly "American" literary voice. In addition, this class will consider the literatures of Native Americans faced with invasion and of Africans faced with enslavement. Readings will include works by such authors as Columbus, Cabeza de Vaca, Smith, Winthrop, Bradford, Bradstreet, Rowlandson, Taylor, Sewall, Mather, Byrd, Edwards, Franklin, Crèvecoeur, Paine, Jefferson, Equiano, Freneau, Wheatley, Rowson, Brown, Irving, and Cooper.

EN 352. AMERICAN PERIOD - AMERICAN RENAISSANCE 3—0—3
Surveying American literature from the middle of the nineteenth century, this course will explore the major literary, social, and philosophical concerns that define the emergence of a distinctly American literature. The course will cover major movements such as Romanticism, Transcendentalism, Sentimentalism, and the rise of the Slave Narrative by examining readings by such authors as Emerson, Hawthorne, Stowe, Douglass, and Melville.

EN 356 AMERICAN PERIOD — REALISM AND NATURALISM 3—0—3
A study of the two most significant currents in American literature between the Civil War and World War I, this course considers how realist and naturalist writers responded to the economic, social, scientific, and artistic theories and realities of their times. Readings will include works by authors such as William Dean Howells, Mark Twain, Henry James, Kate Chopin, Edith Wharton, Charles Chesnutt, Stephen Crane, Frank Norris, and Theodore Dreiser.

EN 360 AMERICAN PERIOD — MODERNISM 3—0—3
American Literature's "Second Renaissance." Widely ranging and diverse readings in this period (1910-1940) of extraordinary creativity can include Lewis, Anderson, Fitzgerald, Frost, Pound, Eliot, Hughes, Stein, Hemingway, H.D., Toomer, Faulkner, Hurston. Against a background of interrelationship of the arts, numerous movements and approaches to writing may be examined, including Imagism, Stream of Consciousness, Lost Generation, Harlem Renaissance, Objectivism.

EN 361. AMERICAN PERIOD: POSTWAR AMERICAN LITERATURE 3—0—3
Continuing where Modernism leaves off, this course considers writers who came into prominence in the first decades following World War II, challenging virtually all literary conventions of the day and exerting considerable influence on life and culture. Readings may include works by such writers as Ralph Ellison, Robert Lowell, Flannery O'Connor, Sylvia Plath, Anne Sexton, and Eudora Welty, as well as Beat Generation writers like Jack Kerouac, Allen Ginsberg, and William S. Burroughs.

EN 363 AMERICAN PERIOD — CONTEMPORARY AMERICAN LITERATURE 3—0—3
This course considers representative prose, poetry, and dramatic texts of the period following the Vietnam War up to the present day. Readings will be considered against the backdrop of social, political, racial, and historical trends in American society and may include works by such authors as Raymond Carver, David Mamet, Toni Morrison, John Updike, and Kurt Vonnegut.

EN 372 LITERATURE OF THE BIBLE 3—0—3
This course is a study of the Bible as literature and will pay particular attention to the importance of genre.

EN 376. LITERATURE OF WAR 3—0—3
A study of how characters in literature behave under the stress of battle. We will be concerned with issues of fear, heroism, comradeship, and the changing nature of war. We will also explore the different ways in which writers have sought to depict war. Readings will be selected from a wide range of materials, including novels, poems, plays, trench memoirs, essays, and histories.

EN 378. ARTHURIAN LEGEND 3—0—3
Magic, morals, cuckoldry, and comedy, romance, and tragedy are all a part of the legend of King Arthur, which this course will trace from its origin in the chronicles of the ninth century to its most important compendium in the fifteenth, with sidelong glances at modern versions in books and on film. The centerpieces will be Chretien de Troyes's romances and Sir Thomas Malory's "Arthurian," *Le Morte D'Arthur*.

EN 401. THE ENGLISH LANGUAGE: HISTORY AND USE 3—0—3
A general survey of linguistics with emphasis on the history of the English language, phonetics, and grammar theory, including Transformational Grammar. This course is required by many states for certification to teach English. Prerequisite: one 200- or 300-level English course.

EN 406. LITERARY THEORY: WAYS OF READING TEXTS – WORLD LIT. 3—0—3
This course will introduce cadets to the historical development of literary theory and the major critical "schools" that have developed to the present. As part of our investigation, we will discuss the following questions: Why study literature? What literature should be studied, and how do we make that decision? From what viewpoint should we read, given the variety of possible ways to analyze any text? And what tools do we need to facilitate our exploration and analysis of works being produced on an increasingly global literary landscape? In addition to Bressler's *Literary Criticism: An Introduction to Theory and Practice*, we will read Wole Soyinka's *Death and the King's Horseman* (Nigerian), Anita Desai's *Clear Light of Day* (South-Asian Indian), selected poetry by Caribbean, Irish, Iraqi, Chinese, Palestinian, and Polish poets. No prior experience with the study of literary theory is necessary.

EN 413. CHAUCER 3—0—3
A general study of Chaucer's early works and *The Canterbury Tales*, considering Chaucer's sources, his artistry, and his significance as a representative of his time and as a subject of modern critical controversy. Prerequisite: EN 201.

EN 420. STUDIES IN SHAKESPEARE 3—0—3
A study of a selected topic in Shakespeare. See the course schedule for the specific subject. Prerequisite EN 310.

EN 423 MILTON 3—0—3
This course is a survey of Milton's major poetry and prose and will include an intensive study of his epic masterpiece, *Paradise Lost*. Prerequisite: EN 201.

EN 450. SOUTHERN LITERATURE 3—0—3
A study of the literature of the American South, emphasizing how the region's writers described, celebrated, critiqued, and even created aspects of "Southernness." Readings may be focused historically or thematically. Prerequisite: EN 209.

EN 455. AFRICAN-AMERICAN LITERATURE 3—0—3
A study of the literature of the African-American experience, how it works both within and outside of the tradition of mainstream American literature, responding to, emulating, and/or critiquing what our traditional literature says it means to be "American." Readings may be focused historically or thematically. Prerequisite: EN 209.

EN 460. STUDIES IN DRAMA 3—0—3
A study of a selected topic in drama. See the course schedule for the specific subject. Prerequisite: one 200- or 300-level English course.

EN 461. STUDIES IN PROSE 3—0—3
A study of a selected topic in either fiction or non-fiction. See the course schedule for the specific subject. Prerequisite: one 200- or 300-level English course.

EN 463. STUDIES IN POETRY 3—0—3
A study of a selected topic in poetry. See the course schedule for the specific subject. Prerequisite: one 200- or 300-level English course.

EN 464. STUDIES IN WORLD LITERATURE 3—0—3
A study of a selected topic in world literature. See the course schedule for the specific subject. Prerequisite: one 200- or 300-level English course.

EN 465. SEMINARS IN LITERATURE 3—0—3
These courses are intended for cadets who want to enhance their appreciation of literature as well as their ability to talk and to write about it. Enrollment is limited; class discussion is emphasized. In each course, substantial instruction and practice in writing is to be expected. Conferences will be held with cadets to help them plan and execute written work. The literary and artistic content of these courses is eclectic, offering a wide variety of themes, authors, artists, genres, and historical periods. Prerequisite: one 200 or 300 level English course.

EN 473-474. INDEPENDENT READING 3—0—3
Independent reading in a closely-defined field or an individual author or group of authors, under the supervision of the instructor teaching a course in a corresponding subject. Prerequisites for both EN 473 and 474; English major; EN 201, 202, and 209; a 3.0 average in English courses beyond WR 102; permission of the department head. Limit: two independent reading courses in English.

EN 480W. SENIOR CAPSTONE COURSE 3—0—3
In this student-centered seminar, the culmination of their study in the Department of English and Fine Arts, cadets will demonstrate their achievement of the learning outcomes for English majors by creating a capstone portfolio and making an oral presentation to the class. They will revise selected papers and build on previous work – for example, by extending their research or by refining their critical approach. They will also devote a substantial portion of the course to composing and refining an introductory reflective essay explaining how the portfolio reveals the breadth and depth of their accomplishments. Open only to First Class English majors. Prerequisite: EN 250W. Writing Intensive (W).

EN 495. INDEPENDENT READING FOR HONORS 3—0—3
Open only to English Honors candidate who will prepare a bibliography and prospectus on the chosen topic. Prerequisites: EN 201, 202 and 209; a 3.2 average in English courses beyond WR 102; and approval by the Honors Committee and the department head.

EN 496. HONORS THESIS 3—0—3
Open only to English Honors candidates, this course is devoted to preparing an honors thesis. Prerequisites: a grade of B or higher in EN 495 and approval by the Honors Committee and the department head.

FINE ARTS

(Under Administrative Supervision of Department of English and Fine Arts)

Colonels Badgett and Ball and Dr. Ramirez.

Note: A minimum grade of C in WR 102 is a prerequisite for all three-credit 200- and 300-level fine arts courses.

FA 207. PRINCIPLES OF THE VISUAL ARTS 3—0—3
An introduction to the major elements (line, color, texture, etc.), principles of design (symmetry, perspective, etc.), media (oil painting, sculpture, etching, etc.), and criteria of judgment of the visual arts. The aim of the course is to make cadets visually "literate"—to teach them, through analysis and critical evaluation, to see rather than merely to look.

FA 215. STUDIO ART: DRAWING AND THE GRAPHIC ARTS 0—2—1
A course designed to introduce cadets to the basic techniques of draftsmanship and principles of design through practical work in such major media of drawing and printmaking as graphite, charcoal, ink wash, pen and ink, dry point, and etching. Enrollment is limited to sixteen.

FA 216. STUDIO ART: PAINTING 0—2—1
A practical introduction to the materials and techniques of some of the major media of painting and color graphics: watercolor, gouache, oil, acrylic, and lino cut. Although desirable, FA 215 is not prerequisite. Enrollment is limited to sixteen.

FA 251. HISTORY OF ART I 3—0—3
A survey of Western painting, sculpture, and architecture, beginning with the styles of Crete and Mycenae and ending with that of Gothic Europe. Although we will mainly define styles and identify the historical processes that shaped them, we will also pause to discuss such matters as the technology of Roman architecture, the Greco-Roman sources of Early Christian style, and the effects upon later medieval art of pilgrimages and relics.

FA 252. HISTORY OF ART II 3—0—3
A survey of the styles of Western painting, sculpture, and architecture that existed between 1400 and 1900: Flemish, Renaissance, Mannerist, Baroque, Rococo, Neo-Classical, and so on. In addition to defining styles, we will discuss such phenomena as the secularization of religious art after 1400, the changing relationship between the artist and his patron, and the rebirth of still life and landscape in 17th-century painting.

FA 340. INTRODUCTION TO MUSIC 3—0—3
Following a study of the fundamentals of music theory and notation, we will survey the styles of Western music: Medieval, Renaissance, Baroque, Classical, Romantic, and Modern. Although we will briefly consider such matters as the influence of architecture on music, the evolution of instruments, and the social status of the composer and the performer, we will devote ourselves mainly to studying the forms with which such major composers as Bach, Beethoven, Schubert, and Stravinsky have given shape to their inspiration.

FA 346. THE FILM 2—3—3
Through a study of the history and aesthetics of the film, films themselves, and their significant critics, the course seeks to establish substantial grounds for understanding and evaluating the film as an art form.

FA 362. MODERN ART 3—0—3
A study of the art—chiefly the painting—of 1800-1970: a period of unparalleled richness, diversity, and innovation. We will closely examine the works of major figures like Courbet, Manet, Cézanne, Van Gogh, Munch, Picasso, and Kandinsky so as to gain a better understanding of such cultural phenomena as the birth of the avant-garde, the embrace of the irrational, and the incorporation into Western styles of the modes of expression of Oriental and African art.

FA 364. ART AND REVOLUTION: PROPAGANDA IN 19th AND 20th CENTURY EUROPE AND AMERICA 3—0—3
A study of visual artists' responses to some of the major revolutionary events of the last 200 years, including the French Revolution, World War I, the Nazi-Bolshevik struggles in Weimar Germany, and World War II. Although we will look at examples of popular art—posters, propaganda films, and so forth—as documents of the social upheavals that inspired them, we will chiefly concern ourselves with the paintings, drawings, and graphic works of such important "fine" artists as David, Goya, Delacroix, Daumier, Grosz, and Kollwitz.

FA 375-380. SPECIAL SEMINARS 3—0—3
Seminars on individual artists, composers, topics, or problems, as suggested from time to time by members of the faculty or by groups of cadets.

FA 375X. ASIAN ART: INDIA, CHINA, AND JAPAN 3—0—3
This course is an introduction to the art and architecture of India, China, and Japan. Covering nearly 4,000 years of art and history produced by a massive area of the world—the Far

East—the course will present the main lines of development of these cultures and their arts. Emphasis will be placed on recognition and identification of major works of art, including sculpture, ceramics, painting, and architecture, and associated styles from each period/dynasty. Prerequisite: WR 102 with a minimum grade of C. Civilizations and Cultures (X).

FA 383. WESTERN ARCHITECTURE 3—0—3
After discussing principles of structure and problems of stress, we will examine the various methods by which Western architects have enclosed and articulated space. Moving chronologically from sixth century BC Greece to twentieth century America, we will define the structural and decorative conventions of the major styles in their cultural contexts. Working independently, each cadet will prepare a research project based upon the study of an important local building. Because Lexington is located in an architecturally rich area, there will be several field trips. Enrollment limited to sixteen.

FA 385. MODERN ART AND THE GREAT WAR 3—0—3
It is ironic that World War I, a war of stalemate and attrition that claimed 10,000,000 victims, inspired a rich outpouring of visual art. In this course we will study the paintings, original prints, and works of sculpture that it inspired—documents of the "war fever" of 1911-1914, of the protracted agony of the war itself, and of the bitter disillusionment that followed. Each work of visual art will be examined against its cultural background, the details of which will be provided by slide-illustrated lectures on the history of the period, readings from poems and trench memoirs, recordings of both popular and "serious" music inspired by the war, and films with World War I settings.

FA 401. INDEPENDENT STUDY IN FINE ARTS 3—0—3
Independent study of an individual artist, a school of artists, or a historical period, under the supervision of the instructor teaching a course in a corresponding subject. Prerequisite: 3.0 average in two Fine Arts lecture (three-credit) courses and permission of the department head. Limit: one independent study course in Fine Arts.

FA 407. ART HISTORY THESIS 3—0—3
Guided by the instructor, the cadet will select a problem in some area of the visual arts—painting, the graphic arts, sculpture, or architecture—explore it intensively, and, applying the methods of criticism and scholarship, produce a paper of "honors" quality. Designed mainly but not exclusively for cadets planning postgraduate work in art history. Prerequisites: A 3.5 average in FA 251 and FA 252 and permission of the department head.

WRITING

(Under Administrative Supervision of Department of English and Fine Arts)

Note: A minimum grade of C in WR 101 is a prerequisite for WR 102, and a minimum grade of C in WR 102 is a prerequisite for all 200- and 300-level English and Writing courses. All 400-level courses have additional prerequisites, which are listed in the course descriptions. These prerequisites may be waived by the department head if there is evidence that the cadet is well prepared for the 400-level course.

WR 101. ENGLISH COMPOSITION I 3—0—3
This course teaches students to analyze texts, introduces them to the writing process, and develops their ability to write a well-organized essay that advances a clear, logical thesis. Minimum grade of C required. Cadets cannot take this course if they have already taken WR 102.

WR 102. ENGLISH COMPOSITION II 3—0—3
This course reinforces students' understanding of the writing process, enhances their ability to analyze the role(s) of the teacher/tutor, responding to texts-in-progress, and continuing to inform and advance an argument. Minimum grade of C required. Prerequisite: Minimum grade of C in WR 101. Cadets cannot take this course if they have already taken EN 102.

WR 220. TEACHING WRITING 3—0—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 tutors in the VMI Writing Center.

WR 230. RHETORICAL TRADITIONS 3—0—3
An introduction to the history of rhetoric that highlights its relationship to reading, writing, and speaking in modern contexts. Emphasis will be placed on defining rhetoric—its traditions, terms, and enduring realms of influence. The course provides a foundation in the principles of classical rhetoric that will be explored further in upper-level writing courses. Cadets cannot take this course if they have already taken EN 230.

WR 330. CREATIVE WRITING - FICTION 3—0—3
A seminar that introduces students to the writing of fiction. It requires students to analyze the works of both established writers and classmates and to write and extensively revise their own fiction. A final writing project is required in lieu of a final examination. Cadets cannot take this course if they have already taken EN 330.

WR 332. CREATIVE WRITING - POETRY 3—0—3
A seminar that introduces students to the writing of poetry. It requires students to analyze the works of both established writers and classmates and to write and extensively revise their own poetry. A final writing project is required in lieu of a final examination. Cadets cannot take this course if they have already taken EN 332.

WR 334. CREATIVE WRITING - NONFICTION 3—0—3
A seminar that introduces students to nonfiction genres (e.g., biography, the memoir, the personal essay) and requires them both to analyze the works of established writers and classmates and to write and revise extensively their own nonfiction. A final project is required in lieu of a final examination. Cadets cannot take this course if they have already taken EN 334.

WR 340. WRITING FOR THE PROFESSIONS 3—0—3
The chief purpose of this course is to improve the pre-professional candidate's ability to write clear, precise, effective, and grammatically accurate prose in the composition of critical essays, letters, reports, memoranda, opinions, briefs, and/or research documents. Cadets cannot take this course if they have already taken EN 340.

WR 342. TECHNICAL WRITING 3—0—3
A skills course that focuses on practical writing in the world of work. Emphasis will be given to individual practice in business correspondence, report writing, and résumé preparation, but the course also offers students a chance to tailor assignments to their specific writing needs and interests. Cadets cannot take this course if they have already taken EN 342.

WR 345. JOURNALISM 3—0—3
A seminar that introduces students to writing news articles. It requires students to submit balanced and accurate news articles based on personal interviews and research. In lieu of a final examination, each student will submit a long feature article which demonstrates a mastery of the journalistic skills and principles taught in this course (newsworthiness, form, interviewing, balance, accuracy, attribution, liveliness, research, and use of multiple and conflicting sources). Cadets cannot take this course if they have already taken EN 345.

WR 347. ADVANCED COMPOSITION 3—0—3
A seminar offering advanced practice in essay and research paper writing, with particular emphasis on argumentation. The course emphasizes logic, the use of evidence, grammar and usage, and the development of a mature appropriate style. Assignments may focus on a single theme for the entire term, or students may be encouraged to explore topics of individual interest. A substantial final research project is required in lieu of a final examination. Cadets cannot take this course if they have already taken EN 347.

WR 349. PROFESSIONAL EDITING AND DESIGN 3—0—3
This course will focus on the principles of manuscript editing, editorial correspondence, and document design. Emphasis will be placed on rhetorical analysis, collaborating with authors, and developing strategies for successfully producing a print journal.

WR 468. SEMINAR IN RHETORIC AND WRITING 3—0—3
A focused, in-depth study of specific subjects in the fields of rhetoric and writing designed to provide cadets with the opportunity to engage particular questions, controversies, or issues. Seminars may be developed in the fields of rhetoric, composition, linguistics, creative writing, technical writing, professional writing, or journalism. Topics may invite the study of theoretical and practical concerns, historical moments, significant figures, or current events among others. Prerequisite: appropriate rhetoric or writing course or permission of the department head. The course number of the appropriate prerequisite will be included in the preregistration materials. Cadets cannot take this course if they have already taken EN 468.

WR 470. INTERNSHIP IN WRITING 3—0—3
With a faculty sponsor, the cadet will arrange for work in written communication with a local business or industry (5-10 hours per week). In addition to submitting work for periodic evaluation by his or her supervisor, the cadet will prepare a portfolio of writing (in lieu of a final examination) to be evaluated by the faculty sponsor at the conclusion of the internship. Prerequisites: WR 340, 342, 345, or 347, agreement of the faculty sponsor; and permission of department head. Cadets cannot take this course if they have already taken EN 470.

FRENCH

See Department of Modern Languages, page 100.

GEOLOGY

(Under Administrative Supervision of Department of Civil and Environmental Engineering)

GE 306. ENGINEERING GEOLOGY 2—3—3
Earth material properties and geological processes as they apply to the solution of engineering problems. Prerequisite: Enrollment in civil engineering or permission of instructor.

GERMAN

See Department of Modern Languages, page 100.

DEPARTMENT OF HISTORY

Colonels Wilkinson (Head), Davis (Emeritus), Jensen, Koeniger, Koons, McCleskey, Sheldon, Vandervort; Capt. Turner; LTC Andreeva, Dowling; Maj. Osborne; Dr. Kiracofe; Mr. Coffey.
Requirements for a major in history are specified on pages 56-58.

HI 103. WORLD HISTORY I 3—0—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 3—0—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 METHODOLOGY 3—0—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 Well: A grade of "C" or better is required as a pre-requisite to one of the 300-level methodologically intensive courses.

HI 205. HISTORY OF THE UNITED STATES I 3—0—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 206. HISTORY OF THE UNITED STATES II 3—0—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 3—0—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 225. HISTORICAL METHODS. IRAN: PAST AND PRESENT 3—0—3
This is a laboratory course that introduces history majors to the basic sources, methods and skills necessary for writing history. The class is designed to guide mainly third classmen through the process of conducting historical research, including finding and analyzing sources and engaging with them critically, and presenting their results clearly and effectively. Topics from Iranian history of different periods are used as historical material for students to work on and experiment with. **Region: Africa/Asia/Latin America.**

HI 301. ANCIENT EGYPT 3—0—3
An upper-level survey course covering the history of Egypt from the predynastic period through the Roman occupation. **Region: Africa/Asia/Latin America.**

HI 302. ANCIENT GREECE 3—0—3
An upper-level survey course which covers the Greek world from the Trojan War to the death of Cleopatra. **Region: Europe or Africa/Asia/Latin America, but not both.**

HI 303. ANCIENT ROME 3—0—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. **Region: Europe or Africa/Asia/Latin America, but not both.**

HI 304. THE MEDIEVAL WORLD 3—0—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 impacts on these areas. **Region: Europe or Africa/Asia/Latin America. May be writing intensive when offered as HI 454W.**

HI 307. ENGLISH HISTORY I 3—0—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. **Region: Europe.**

HI 308. ENGLISH HISTORY II 3—0—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. **Region: Europe.**

HI 309. HISTORY OF THE HOLOCAUST 3—0—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. **Region: Europe.**

HI 310X. WAR AND SOCIETY IN MODERN CHINA 3—0—3

This course introduces cadets to the 30-year cycle of civil war and international conflict that China experienced from the 1920s 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. Prerequisite: HI 104. **Region: Asia/Africa/Latin America.** Civilizations and Cultures (X).

HI 313. THE UNITED STATES, 1900-1945 3—0—3

A comprehensive study of the United States during the Progressive Era, World War I, the 1920s, and the Great Depression. **Region: United States.**

HI 314. THE UNITED STATES SINCE 1945 3—0—3

A comprehensive study of the United States from World War II through recent years. **Region: United States.**

HI 315. THE HISTORY OF EVERYDAY LIFE 3—0—3

Social history is an approach to the past which 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 which 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. **Region: Europe or United States, but not both. Methodologically intensive.**

HI 319. THE AFRICAN AMERICAN EXPERIENCE 3—0—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. **Region: United States. Methodologically intensive.**

HI 321. THE OLD SOUTH 3—0—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. **Region: United States.**

HI 322. THE CIVIL WAR AND RECONSTRUCTION 3—0—3

The causes and course of the American Civil War and the issues and consequences of Reconstruction. **Region: United States.**

HI 323 HISTORY OF THE SOUTH FROM 1865 3—0—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. Prerequisite: HI 206 or permission of instructor. **Region: United States. Methodologically intensive.**

HI 324. AMERICAN FOREIGN RELATIONS TO 1919 3—0—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. **Region: United States.**

HI 325. AMERICAN FOREIGN RELATIONS SINCE 1919 3—0—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. Prior completion of HI 324, "American Foreign Relations to 1919" is recommended, but not required. **Region: United States.**

HI 327. INDIA FROM THE AGE OF THE HARRAPANS TO THE PRESENT DAY 3—0—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. **Region: Africa/Asia/Latin America.**

HI 328. BRITISH IMPERIALISM 3—0—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. **Region: Europe or Africa/Asia/Latin America.**

HI 330. TOPICS IN ANCIENT HISTORY 3—0—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. **Region: Europe or Africa/Asia/Latin America, but not both. Methodologically intensive.**

HI 331. COLONIAL AMERICA 3—0—3

A study of eastern North America from contact through the American revolution. The early colonial section examines major social, political, religious, and economic trends, plus evolving relationships with Indians. The revolutionary section examines the complex forces which produced the American rebellion and concludes with a campaign history of the Revolutionary War. **Region: United States. Methodologically intensive.**

HI 332. NORTH AMERICAN INDIANS 3—0—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. **Region: United States. Usually offered as Writing Intensive.**

HI 333. HISTORY OF THE MIDDLE EAST I 3—0—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 Islam as both a religion and a civilization and includes the study of the Islamic faith and its institutions, the political history of the region and aspects of the culture, particularly art and architecture. **Region: Africa/Asia/Latin America.**

HI 334. HISTORY OF THE MIDDLE EAST II 3—0—3

Continues the History of the Middle East in the modern period. The course begins in the eighteenth century with the waning of the power of the Ottoman Empire and follows the region through a period of historic change and transformation to the present. Students will focus on the following issues, among others: the socio-economic transformation of the region in the 19th century, European imperialism and colonialism, the evolution of the modern state system, the conflict over Palestine and the rise of political Islam. **Region: Africa/Asia/Latin America.**

HI 335. THE VIETNAM WAR 3—0—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. **Region: Africa/Asia/Latin America.**

HI 336. ISLAM IN NORTH AMERICA AND WESTERN EUROPE 3—0—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 methodologically intensive course examines 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 from the Middle East and Africa, and the process of their integration into Western societies. Looking beyond mutually hostile stereotyping between Islam and the West is one of the objectives of the class. **Region: United States or Europe, but not both. Methodologically intensive.**

HI 346. MODERN JAPAN 3—0—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. **Region: Africa/Asia/Latin America.**

HI 348. AFRICA IN MODERN TIMES, 1700 to PRESENT 3—0—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. **Region: Africa/Asia/Latin America.**

HI 350. FRENCH REVOLUTION AND NAPOLEON 3—0—3

A study of the collapse of the *Ancient 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. No prerequisite. **Region: Europe. Methodologically intensive.**

HI 355. GRAND STRATEGY IN THE TWENTIETH CENTURY 3—0—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 356. TWENTIETH-CENTURY CHINA 3—0—3

A study of China's twentieth-century revolutions since the overthrow of the last emperor in 1911. Examines the tortured efforts of the Nationalists and Communists to recreate the country and the culture, even while foreign "barbarians" were pounding on the gates. Studies a century of civil war, social reform movements, and political purges, concluding with Deng Xiaoping's recent efforts to build a modern China where "to get rich is glorious." **Region: Africa/Asia/Latin America.**

HI 357. LATE IMPERIAL CHINA 3—0—3

Major events and trends in Chinese history during the last two great dynasties, the Ming (1368-1644) and the Qing (1644-1911), including historians' evolving interpretations of the periods. Topics include the role of the emperor, the world of the peasantry, the dynastic cycle, The Opium War, the problem of imperialism, the great Taiping Rebellion, The Boxer

Uprising, and the 1911 Revolution. Prerequisite: HI 104. Region: Africa/Asia/Latin America. Methodologically intensive.

HI 361. THE AGE OF BLOOD AND IRON. EUROPE, 1871-1918 3—0—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. Region: Europe.

HI 365. FRANCE AND THE FRENCH EMPIRE 1815 TO THE PRESENT 3—0—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. No prerequisite, but HI 350 is recommended. Region: Europe.

HI 368. A BROKEN WORLD: EUROPE, 1919-1945 3—0—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 as Mussolini, Hitler, Stalin, and Churchill. It then deals with events leading to the Second World War, and the war itself. Region: Europe.

HI 372. READING COURSE FOR HONORS 3—0—3

Reading in depth in a selected field of history under the supervision of a faculty sponsor as preparation for an honors research paper. Preparation of an annotated bibliography and introduction to historical methodology. Prerequisite: Admission to the History Honors Program. Methodologically intensive.

HI 373. COLONIAL LATIN AMERICA 3—0—3

A survey of historical developments from the Iberian Reconquest through the Wars of Independence in Latin America. Region: Africa/Asia/Latin America. Methodologically Intensive. May also be offered as Writing Intensive.

HI 374. MODERN LATIN AMERICA 3—0—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. Region: Africa/Asia/Latin America. Methodologically Intensive. May also be offered as Writing Intensive.

HI 375. GERMANY AND EASTERN EUROPE FROM BISMARCK TO BRANDT 3—0—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. Region: Europe.

HI 377. INSURGENCY AND TERRORISM 3—0—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. Methodologically intensive. Region: Europe or Asia/Africa/Latin America, but not both.

HI 378. EUROPEAN WARFARE, 1600-1871 3—0—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. Region: Europe.

HI 379. EUROPEAN WARFARE SINCE 1871 3—0—3

This course introduces students to major aspects of European warfare from the unification of Germany in 1871 through the Cold War. Key themes include the evolution of military thought and the operational, political, socio-cultural, and technological aspects of armed forces and war. Region: Europe.

HI 380. EUROPE IN RENAISSANCE AND REFORMATION 3—0—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. Region: Europe. Methodologically Intensive.

HI 382. MODERN RUSSIAN HISTORY 3—0—3

A survey of the history of Russia, stressing economic, political, social, and intellectual development during the Empire and the Soviet Union. Region: Europe.

HI 383. VIRGINIA HISTORY I 3—0—3

A survey of the political, social, economic, and cultural history of Virginia from 1607 to 1865. Region: United States.

HI 384. VIRGINIA HISTORY II 3—0—3

A survey of the political, social, economic, and cultural history of Virginia from 1865 to the present. Region: United States.

HI 385. U.S. MILITARY HISTORY TO 1919 3—0—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. Region: United States.

HI 386. U.S. MILITARY HISTORY SINCE 1919 3—0—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. Region: United States.

HI 387. HISTORY OF AIR POWER 3—0—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. Region: Europe or the United States (but not both).

HI 388. MODERN SPAIN: CIVIL WAR AND COLONIAL CONFLICT 3—0—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. Region: Europe. Methodologically intensive.

HI 390. SEA POWER FROM THE AGE OF SAIL TO THE EARLY TWENTIETH CENTURY 3—0—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. Region: Europe.

HI 391. SEA POWER IN THE 20th CENTURY 3—0—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. Region: Europe or the United States (but not both).

HI 392 WORLD WAR I 3—0—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. Region: Europe or the United States, but not both.

HI 393. WORLD WAR II 3—0—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. Region: Europe or the United States or Africa/Asia/Latin America (can fulfill one category only).

HI 400. HISTORY INTERNSHIP 0—0—1 to 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 460W. CAPSTONE EXPERIENCE 3—0—3

Senior level methodologically intensive research seminar leading to the production of a major research paper. Topics vary. Prerequisite: completion of a 300-level methodologically intensive course, and perhaps other prerequisites at the discretion of the instructor. 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. Writing Intensive (W).

HI 480. DIRECTED STUDY 3—0—3

Advanced level one-on-one course emphasizing historical methodology and leading to the production of a major research paper. Pre-requisite: 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. May also be taken as a writing-intensive course (480W) with instructor's permission.

HI 481-490, and 493 to 499. SPECIAL SEMINAR 3—0—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 (I) 3—0—3
Preliminary work on a research paper based on the reading done in HI 372. Prerequisite: HI 372. Course concludes with an oral defense of a draft version of the thesis. Writing intensive (W).

HI 492W. THESIS COURSE FOR HONORS (II) 3—0—3
Embraces the completion of the research paper begun in HI 491. Prerequisite: HI 491. Writing intensive (W).

HONORS PROGRAM

For information pertaining to the Institute Honors Program, please see page 16.

HN 100. HONORS FORUM 1—0—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.

HNL . HONORS SEMINAR - LIBERAL ARTS/LEADERSHIP 3—0—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*. Prerequisite: Admission to the Institute Honors Program.

HNS. HONORS SEMINAR - SCIENCE/ENGINEERING 3—0—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: Admission to the Institute Honors Program.

HN 400-401. HONORS THESIS/PROJECT RESEARCH 3—0—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 Colonel McDonald in the Dean's Office for details.

DEPARTMENT OF INTERNATIONAL STUDIES AND POLITICAL SCIENCE

Brig. Gen. Brower; Colonels Hentz (Head), and Burnett; Captain Turner; Lt. Colonel Foster; Majors Holston and Sanborn; Mr. Ayer, Mr. Belliveau, Mr. Blair, and Mr. Russell.

Requirements for a degree in international studies and political science are specified on pages 59.

IS 201. INTRODUCTION TO INTERNATIONAL STUDIES AND POLITICAL SCIENCE 3—0—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 3—0—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 3—0—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 3—0—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 2—2—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. Prerequisites: open only to international studies majors who have passed IS 201 with a grade of 75 or higher.

IS 310. AMERICAN FOREIGN POLICY 3—0—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 3—0—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 3—0—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 320. NATIONAL SECURITY POLICY 3—0—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 3—0—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. Prerequisites: PO 325 International Politics or PO 350 Comparative Politics.

IS 322. INTELLIGENCE AND POLICY 3—0—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 323. THE UNITED STATES, PAKISTAN, AND AFGHANISTAN 3—0—3
Cadets learn of historical factors and conflicts that have shaped the situation today with particular emphasis on the period from the start of extensive Soviet involvement in the 1970's through the resurgence of the Taliban in the mid-2000s. They track political and military developments relying on a variety of news and think tank sources and examine various options for resolving the conflict from the US perspective. They make a field trip to Washington.

IS 325X: THE UNITED STATES AND IRAN 3—0—3
This civilizations and cultures designated course focuses on the modern history of Iran and its relationship with the US. Cadets analyze policy options for addressing various challenges that Iran – especially if it gains a nuclear weapons – presents to the region, to the US and the world. Cadets make a field trip to Washington to speak with experts in think tanks and to examine Iranian cultural artifacts at the Smithsonian Museum.

IS 330. POLITICS IN WESTERN EUROPE 3—0—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 3—0—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 3—0—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 designation.

IS 333. POLITICS IN SOUTHEAST ASIA 3—0—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 335. POLITICS IN LATIN AMERICA 3—0—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 336X: POLITICS IN CHINA 3—0—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. Civilizations and Cultures designation.

IS 340. POLITICAL THEORY 3—0—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 370-379. INTERMEDIATE SPECIAL SEMINAR 3—0—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 380. NATIONAL SECURITY AND HOMELAND DEFENSE SEMINAR 3—0—3

American National Security is entering a period of long-term transformation – both in terms of global policy and force projection and with regards to our domestic policy and intelligence structures and production. Homeland Security is the new operational definition/moniker for these activities and in this seminar students will acquire an in-depth knowledge of how American national security policy will be devised and executed in a post-9/11 world.

IS 381. SCIENCE, TECHNOLOGY, AND INTERNATIONAL AFFAIRS 3—0—3

This course focuses on the intersection of scientific research, technological applications and change, and business and governmental activities in these areas that impact upon national security and international relations. In international politics, states seek to gain power over other states. In addition, NGO's compete for influence over international affairs in both direct and more subtle manners. Science and technology applications enhance both state and NGO power profiles, and hence, their ability to affect international relations. In other cases, such applications result in the deterioration of state and NGO power and in increase in international chaos. An important dimension of this course is the training of students in problem solving, information management, and procedures in policy-making for this growing area of international concern.

IS 382. THE POLITICAL ECONOMY OF BIOTECHNOLOGY 3—0—3

Biotechnology is the practical application of rational genomic science to the task of re-engineering species (to include human beings) in part – parts – whole and or species. If fully realized – the power of biotechnology poses to become an important tool of the state. It is already an economic tool – which this course will examine heavily – and portends to become an important tool of national security forcing standard models of international relations theory to expand and accommodate new visions of what a nation-state might be as cultural evolution is likely to speed up in reaction to unprecedented increase in the pace of biological evolution. The course will train the student in the economic, political, business, regulatory, and ethical and moral dimensions and conceptual frameworks that house the biotechnology industry.

IS 401W. INTERNATIONAL STUDIES SEMINAR 3—0—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.

IS 421. THE POLITICS OF TERRORISM 3—0—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.

IS 422. DOMESTIC POLITICS AND INTERNATIONAL CONFLICT 3—0—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 430W. DEMOCRACY AND ELECTIONS 3—0—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.

IS 432W. POLITICAL AND ECONOMIC DEVELOPMENT IN SUB-SAHARAN AFRICA 3—0—3

An analytical survey of the economic and political development of post-colonial Africa. The focus is the nature of the African state, from its patrimonial beginnings in the early postcolonial era to, in many cases; today's collapsed state. Particular attention is placed on the interaction of politics and economics and on the impact of external factors on the "modern" African state. The driving question of the course is what are the prospects for political stability and for economic advancement in Sub-Saharan Africa.

IS 433. SOUTH ASIAN POLITICS & INTERNATIONAL RELATIONS 3—0—3

This course provides an introduction to the politics of the major states of South Asia (also referred to as the Indian subcontinent), a region that encompasses nearly one-fifth of the world's population. We will focus on India and Pakistan, examine Afghanistan briefly, and survey key issues in the politics of Bangladesh, Sri Lanka, and Nepal. We will also seek insights into international relations and conflict in the region (e.g. Kashmir, nuclear weapons development), and assess South Asia's significance in world politics.

IS 435X. COMPARATIVE POLITICAL ECONOMY 3—0—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. Civilizations and Cultures designation.

IS 436. WAR AND PEACE IN AFRICA 3—0—3

This course is presented as an argument. Africa has had serious conflicts in the past twenty-five years, with casualties between 3,800,000 and 6,899,000. There are more U.N. peace keeping troops in Africa than on any other continent, as of 2006 seventy five percent of all UN peacekeepers were in Africa; the U.N. has conducted nineteen "complex peace operations" since the end of the Cold War, ten of them in Africa. During the last decade, more than half of Africa's states have been in warfare. It is home to most of the world's conflicts. The fact that Africa leads the international system in conflict begs for an explanation why. The fact that these wars do not look like classical wars also begs for an explanation. The class is run as a seminar. Therefore, while there will be class lectures, the course will largely revolve around discussions of the readings assigned for that week

IS 440. AMERICAN POLITICAL THOUGHT 3—0—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 Anti-federalist writings, Thomas Jefferson, Alexis de Tocqueville, John C. Calhoun, Abraham Lincoln, Edward Bellamy, John Dewey, Herbert Croly, and others.

IS 441. CONSERVATIVE POLITICAL THOUGHT 3—0—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 3—0—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 450. CRIMINAL LAW 3—0—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 451. CONSTITUTIONAL LAW 3—0—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 452. INTERNATIONAL LAW 3—0—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 460W. RESEARCH DESIGN FOR POLITICAL SCIENCE 3—0—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. Prerequisites: a minimum grade of C in WR 102, IS 201, IS 301. Should be taken during the second semester of the second class year.

IS 470-479. ADVANCED SPECIAL SEMINAR 3—0—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 480X: SCIENCE AND WAR 3—0—3

In this civilizations and cultures designated course, cadets learn of scientific discoveries and inventions resulting in technologies that have changed the nature of warfare. They examine the potential of science to contribute to 21st century warfare with a current emphasis on terrorism and asymmetrical warfare. They study giants of the scientific or engineering establishments who have made extraordinary contributions to the ways wars are fought with particular emphasis on those who were not native-born Americans. They make a field trip to Washington DC.

IS 490. INDEPENDENT STUDY 3—2—3

Research and writing of a substantial paper on an approved topic, under the direction of International Studies faculty. Prerequisite: Permission of the department head.

IS 491. READING FOR IS HONORS 3—0—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: Admission to the IS Honors Program.

IS 492. WRITING FOR IS HONORS 3—0—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: Grade of B or better in IS 491.

IS 493. INTERNATIONAL STUDIES SENIOR THESIS 3—0—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: Grade of B or better in IS 491 and IS 492.

IS 494. PUBLIC SECTOR INTERNSHIP 1—4—3

Cadets' work as interns with public-sector agencies, under the supervision of a member of the IS faculty in conjunction with officials from the agency involved. Course work will include readings, designing and carrying out of a suitable project with the agency, and preparation of a final paper and interview by supervising faculty. Open to first and second class IS majors. Prerequisite: permission of department head.

SCIENCE AND SECURITY

SS 340. BIOLOGICAL AGENTS IN WARFARE AND TERRORISM 3—0—3

This course will cover the types of biological agents that may be used in warfare or employed by terrorists. The effects 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 biologicals as weapons including manipulation of current pathogens to maximize their destructive threat.

SS 341. ENVIRONMENTAL TERRORISM 3—0—3

A review of environmental terrorism – the unlawful acts against in-situ environmental resources – through lecture, discussion, and personal research. Readings will include fiction and nonfiction sources and encompass scholarly publications, news accounts, and popular media. Topics will be examined from the perspectives of resource-as-target terrorism and resource-as-tool terrorism in the context of current and historical events. Terrorism against or employing water resources, agricultural and forest resources, mineral and petroleum resources, and wildlife and ecosystem resources will be discussed specifically.

SS 342. CHEMICAL, EXPLOSIVE, AND RADIOLOGICAL AGENTS THEIR CHEMISTRY AND DETECTION 3—0—3

This course is a study of chemical, explosive, and radiological (CER) materials and how their chemical and physical characteristics are used to detect and identify them. The first half of this course will focus on the chemistry and physical properties of chemical agents that pose a threat to the security of our military and civilian populations. The second half of the course will survey explosive and radiological threats and examine current methods of detecting and analyzing CER agents. Prerequisites: Completion of CH 132 or CH 138 with a grade of C or better.

SS 343. COMPUTER FORENSICS 3—0—3

This course introduces cadets to the use of tools to extract information from a computer to fight crime and terrorism. The course examines legal issues such as the chain-of-custody for evidence, and ethical issues such as personal privacy. Related topics include an overview of computer and network forensics, computer concepts, network concepts, and network forensics. No previous knowledge of computer forensics or detailed workings of computers or networks assumed.

SS 344. THE MAKING AND BREAKING OF CODES 3—0—3

A study of the historical development of cryptology from the oldest recorded codes taken from hieroglyphics to modern schemes used to maintain privacy. Since secret codes are based on mathematical ideas, this course will examine rules and ideas from probability, substitution, transpositions, permutations, Boolean algebra and modular arithmetic. Hostile cryptanalytic attacks will also be discussed.

SS 345. INFORMATION SECURITY 3—0—3

This course covers the basics of computer and network security. Topics include information security; risk assessment and management; best practices; security auditing principles and practices; Intrusion Detection Systems (IDS) and Intrusion Prevention Systems (IPS); disaster recovery planning; incident response; security tools and software; legal and ethical issues. Some technical background is useful, but there are no CS course prerequisites.

SS 347. SCIENCE, TECHNOLOGY, AND INTERNATIONAL AFFAIRS 3—0—3

This course focuses on the intersection of scientific research, technological applications and change, and business and governmental activities in these areas that impact upon national security and international relations. In international politics, states seek to gain power over other states. In addition, NGO's computer for influence over international affairs in both direct and more subtle manners. Science and technology applications enhance both state and NGO power profiles, and hence, their ability to affect international relations. In other cases, such applications result in the deterioration of state and NGO power and in increase in international chaos. An important dimension of this course is the training of students in problem solving, information management, and procedures in policy-making for this growing area of international concern.

SS 350. SCIENCE, SECURITY, AND INTELLIGENCE 3—0—3

This course seeks to train the student in the evolving practices of intelligence collection, analysis, and production for national security and homeland defense. Specific emphasis will be placed upon the role of human and science and technology based solutions to the needs of the nation's policymakers in the post 9/11 intelligence community. Students will learn about new intelligence structures and the mission to create a greater intelligence awareness of national and homeland security threats.

SS 440. SCIENCE AND SECURITY CAPSTONE RESEARCH COURSE 3—0—3

This course brings together cadets and faculty from different disciplines to address an important national security/homeland defense problem. Cadets will work in security related internships in Washington, DC, that will be integrated into their academic capstone research product. This product will be the outcome of the cadet's research into a science or engineering-based problem or a social science or policy-based problem that examines its policy implications for national security and/or homeland defense solutions. Pre-requisite: SS 350.

SS 360. NATIONAL SECURITY AND HOMELAND DEFENSE POLICY SEMINAR 3—0—3

American National Security is entering a period of long-term transformation – both in terms of global policy and force projection and with regard to our domestic policy and intelligence structures and production. Homeland Security is the new operational definition/moniker for these activities and in this seminar students will acquire an in-depth knowledge of how American national security policy will be devised and executed in a post-9/11 world.

INTRODUCTION TO INFORMATION TECHNOLOGY

(Under Administrative Supervision of Department of Mathematics and Computer Science.)

ITD 111. INTRODUCTION TO INFORMATION TECHNOLOGY 3—0—3

This course is an introductory survey of the scope of information technology and design. This course provides an exposure and a foundation from which cadets can appreciate the relevance and interrelationships of future courses in the ITD minor. 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. Prerequisites: none.

JAPANESE

See Department of Modern Languages, page 100.

LEADERSHIP STUDIES & CAREER DEVELOPMENT

(Under Administrative Supervision of Department of Psychology and Philosophy.)

LS 350. LEADERSHIP AND CAREER DEVELOPMENT I 0—1—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 0—1—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 0—1—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 0—1—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.

DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE

Colonels Baker, Dewald, Gluck, Than, and Walsh; Lieutenant Colonel Hartman, Siemers (Head); Commander Joseph; Majors Axvig, Chalishajar, Cone, Cox, David and Herald; Dr. Mirabella, Mr. Chalishajar, Mr. Lowe, Mr. Miller, Mr. Vosburg; Ms. Randall, and Mrs. Hough. Requirements for a major in applied mathematics are specified on page 32.

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 103. MATRIX ALGEBRA 2—0—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 3—0—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 3—0—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: MA 105.

MA 108. INTRODUCTION TO PROBABILITY & STATISTICS 3—0—3

This course introduces all of the important topics that will be needed to begin a serious study of probability and statistics. Descriptive statistics; counting techniques and basic rules of probability; binomial and normal distributions and the sampling distribution of the sample mean; basics of inference on the population mean using interval estimates and tests of hypotheses. Incoming cadets with credit for AP Statistics do not need to take this course.

MA 110. MATHEMATICAL SOFTWARE 2—0—2

Introduction to the use of mathematical software packages Matlab and Mathcad in applied mathematics, engineering and physics.

MA 114. PRE-CALCULUS MATHEMATICS 3—0—3

Equations and inequalities; functions and their graphs; polynomial and rational functions; exponential and logarithmic functions; trigonometric functions. Recommended only for those cadets who plan to take MA 123. See note above.

MA 123. CALCULUS & ANALYTIC GEOMETRY I 3—0—3

Plane analytic geometry with single variable differential calculus. Limits, derivatives, applications of derivatives, and derivatives of transcendental functions and basic integration formulas. Prerequisites: Placement Test or Pass Grade in MA 114.

MA 124. CALCULUS & ANALYTIC GEOMETRY II 3—0—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: A grade of C or higher in MA 123.

MA 125. QUANTITATIVE METHODS I 3—0—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 3—0—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. Prerequisites: C or better in MA 125.

MA 133. MATHEMATICAL MODELING I 1—0—1

A series of mathematical models are introduced by different faculty members. Each model is developed over several periods. The content will vary from semester to semester but instructors will focus on the modeling and problem solving aspects of their topics.

MA 134. MATHEMATICAL MODELING II 1—0—1

A continuation of MA 133. More examples of mathematical modeling and problem formulation and solution techniques.

MA 215. CALCULUS WITH ANALYTIC GEOMETRY III 4—0—4
A continuation of MA 124; Conic sections, parametric equations, polar coordinates, vectors, vector-valued functions, partial derivatives, improper and multiple integrals. Prerequisite: A grade of C or higher in MA 124.

MA 220. PROBABILITY & STATISTICS FOR ENGINEERS & SCIENTISTS 3—0—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: MA 124.

MA 301. HIGHER MATHEMATICS FOR ENGINEERS AND SCIENTISTS 3—0—3
Boundary value problems, vector analysis, partial differential equations, functions of a complex variable with applications. Prerequisites: MA 215 and MA 311.

MA 303. ADVANCED CALCULUS I 3—0—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: MA 124.

MA 304. ADVANCED CALCULUS II 3—0—3
Implicit-function theorems; Jacobians; vector and scalar point functions; gradient; divergence; line, surface and volume integrals. Prerequisite: MA 303.

MA 305. ELEMENTARY LINEAR ALGEBRA 3—0—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: MA 103 or permission of the instructor.

MA 306. ELEMENTARY NUMBER THEORY 3—0—3
Properties of integers, prime numbers, number theoretic functions, congruencies. Diophantine equations. Prerequisite: Permission of the instructor.

MA 307. APPLIED STATISTICS FOR THE SOCIAL SCIENCES 3—0—3
Treatment of categorical data, contingency tables, analysis of variance, and distribution-free methods. The course will use a statistical software package. Prerequisite: Either MA 106 or MA 108 or MA 220.

MA 311. ELEMENTARY DIFFERENTIAL EQUATIONS 3—0—3
Ordinary differential equations; applications; Laplace transforms; Systems of ODEs. Prerequisite: MA 124.

MA 319. MATHEMATICAL METHODS OF OPERATIONS RESEARCH 3—0—3
Mathematical modeling, linear programming, allocation models, network models, scheduling models. Prerequisites: MA 103 and MA 124.

MA 326. PROBABILITY AND STATISTICS 3—0—3
Simple, discrete, and continuous probability distributions. Sampling from probability distributions and finite populations. Prerequisite: MA 215 and MA 108 or MA 220.

MA 330W. HISTORY OF MATHEMATICS 3—0—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. Prerequisites: One semester of calculus or permission of the instructor. Prerequisite: MA 123 or MA 126 (Preference is given to AM Majors).

MA 401. MODERN ALGEBRA 3—0—3
Basic algebraic properties of groups, rings and fields.

MA 405. STATISTICS 3—0—3
A continuation of MA 326; probability distributions, estimation, hypothesis testing, regression analysis and techniques of experimental design. Prerequisite: MA 326.

MA 407. COMPLEX VARIABLES 3—0—3
Properties of complex numbers; analytic functions; power series, residues and poles; Laurent series. Prerequisite: MA 301, MA 304, or consent of department head.

MA 422. GRAPH THEORY 3—0—3
Graphs, digraphs trees, connectivity, cycles and transferability, and planar graphs. Prerequisite: Permission of the instructor.

MA 432. NUMERICAL ANALYSIS 3—0—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. Prerequisites: MA 110, MA 215 and MA 311.

MA 433. NUMERICAL SOLUTIONS OF DIFFERENTIAL EQUATIONS 3—0—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: MA 311 or consent of instructor.

MA 451-459. INDEPENDENT STUDY 1—0—1 to 3—0—3
Selected areas such as topology, geometry, algebra, real analysis. Recommended for cadets contemplating doctoral programs in mathematics. Prerequisite: consent of department head.

MA 490W. RESEARCH PRACTICUM IN APPLIED MATHEMATICS 3—0—3
An undergraduate research experience in an area of applied mathematics under the tutelage of a member of the Math & CS faculty. Projects are agreed to by cadet and faculty member and culminate with an oral presentation and with a publishable (not necessarily published) paper as determined by the faculty member. Prerequisite: 28 credit hours in Math coursework or First Class Standing. Writing Intensive (W)

MA 471-479. TOPICS IN MATHEMATICS 3—0—3
Selected topics in mathematics such as graph theory, topology, dynamic systems, partial differential equations, spline approximation and operator theory. Prerequisite: Permission of Department Head.

DEPARTMENT OF MECHANICAL ENGINEERING

Colonels Hardin (Head), Arthur, Blandino, Hodges, Neel, and Sadler; Lieutenant Colonel Sullivan; Majors Taylor, Blandino; Captain McMasters; Mr. Beran, Dr. Rice.

Requirements for a major in mechanical engineering are specified on pages 61-64.

ME 105. INTRODUCTION TO MECHANICAL ENGINEERING 0—2—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 0—2—1
Selected CAD applications such as Orthographic and Isometric Design. Use of CAD to solve engineering applications and Solid Modeling Applications. Prerequisite: Proficiency in ME 102 or high school CAD credit.

ME 110. MATERIALS 2—2—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 3—0—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: MA 124 unless previously completed.

ME 203. PROGRAMMING TOOLS FOR MECHANICAL ENGINEERS 1—2—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 3—0—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. Prerequisites: MA 124, ME 109, ME 110 and a grade of C or higher in ME 201.

ME 243/244 ME DESIGN COMPETITION PARTICIPATION 0—1—0.5
Participation in a student design team competition team for underclassmen. Prerequisite: Permission of a team adviser.

ME 255-256. SUMMER RESEARCH 0—2—1 to 0—6—3
ME 355-356. SUMMER RESEARCH 0—2—1 to 0—6—3
ME 455-456. SUMMER RESEARCH 0—2—1 to 0—6—3

Offered to mechanical engineering cadets engaged in summer research. Prerequisite: Permission of department head.

ME 302. DYNAMICS 3—0—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: ME 201.

ME 311. THERMODYNAMICS I 3—0—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: MA 124 and ME 203.

ME 313. THERMODYNAMICS II 3—1—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: A grade of C or higher in ME 331.

ME 314. FLUID MECHANICS 3—1—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: MA 124, ME 201, ME 311.

ME 321. DYNAMICS OF MACHINERY 3—0—3

Application of kinematics and dynamics to the design of mechanical components. Analysis and synthesis of the relationship between machine forces and motions. Prerequisite: ME 302.

ME 322. MECHANICAL ANALYSIS AND DESIGN 3—0—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: A grade of C or higher in ME 206.

ME 325. INSTRUMENTATION LABORATORY 1—2—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: WR 102 and ME 203.

ME 336. HEAT AND MASS TRANSFER 3—1—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. Prerequisites: ME 311 and MA 311.

ME 342. ANALYSIS AND CONTROL OF DYNAMIC SYSTEMS 3—0—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: MA 311 and EE 351.

ME 343/344 ME DESIGN COMPETITION PARTICIPATION 0—1—0.5

Participation in a student design team competition team for underclassmen. Prerequisite: Permission of a team adviser.

ME 412. SOLAR ENERGY 3—0—3

A study of energy resources, consumption, policies and possible future energy scenarios of the U.S.A. and the world. The study and practices of energy conservation principles coupled to economic considerations. An in-depth investigation of Sun-Earth geometric relations and calculations of extraterrestrial and terrestrial instantaneous and long-term solar radiation on surfaces. The study of thermal characteristics of buildings related to passive and superinsulation design technologies. The analysis and design of solar systems including solar collector domestic hot water systems. A number of computer-aided design projects are assigned during the course. Prerequisites: ME 311.

ME 413. AIRCRAFT PROPULSION SYSTEMS 3—0—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: ME 313.

ME 414. TURBOMACHINERY 3—0—3

Theory and performance characteristics bearing on the design of fluid dynamic machines such as centrifugal and axial flow pumps, fans, compressors, and turbines. Prerequisites: ME 314 and ME 311.

ME 415. FLIGHT MECHANICS 3—0—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: 2nd class standing or higher.

ME 416. FUNDAMENTALS OF AERODYNAMICS 3—0—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. Prerequisites: ME 311 and ME 314.

ME 417. AIRCRAFT STRUCTURAL ANALYSIS 3—0—3

Introduction to the linear, static structural behavior relating to aircraft design. Classical methods of analysis will be applied to practical problems. Prerequisites: ME 201 and ME 206.

ME 418. THERMAL ENVIRONMENT ENGINEERING 3—0—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: ME 311.

ME 419. THERMAL-FLUID SYSTEMS DESIGN 3—2—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: ME 313, ME 314, ME 336.

ME 425. MECHANICAL DESIGN 3—2—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: ME 322.

ME 427. INTRODUCTION TO AUTOMATED MANUFACTURING SYSTEMS 2—2—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. Prerequisites: ME 110 and ME 109.

ME 431. POWER PLANT DESIGN 3—0—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. Prerequisites: ME 313, ME 336, and ME 314.

ME 443. ME DESIGN COMPETITION 1—4—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: Permission of department head.

ME 444. MECHANICAL ENGINEERING DESIGN 1—4—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. Prerequisites: ME 419 or ME 425.

ME 457. SEMINAR 0—1—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 1—0—0

Weekly seminars will provide preparation for the spring Fundamentals of Engineering Exam.

ME 461. INDEPENDENT RESEARCH 0—2—1 to 0—6—3

ME 462. INDEPENDENT RESEARCH 0—2—1 to 0—6—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: Permission of department head and faculty or senior thesis adviser.

ME 480. INTERNAL COMBUSTION ENGINE 3—0—3

A study of reciprocating internal combustion engines; basic thermodynamic principles, compression and spark ignition engines, fuels, combustion, emissions, mechanical design considerations. Prerequisite: ME 313 Thermodynamics II.

ME 481. COMPUTATIONAL MODELING AND VIRTUAL DESIGN 3—0—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. Prerequisites: ME 109, ME 313, ME 314, ME 336 and MA 311.

ME 484. FIBER REINFORCED COMPOSITE MATERIALS 2—2—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: ME 206.

ME 485. ADVANCED MECHANICAL DESIGN 2—2—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: ME 425

ME 489. BIOTHERMAL FLUID MECHANICS 3—0—3
This course studies transport processes in the human body. Fluid mechanics topics would include systemic circulation, microcirculation, fluid mechanic aspects of diseases, and artificial flow implants. Heat transfer applications would include micro heat transfer, hypothermia, hyperthermia and thermal lesion, and the regulation of body temperature. Also covered will be blood-gas interaction in erythrocytes, mass transfer in organs, and artificial organs for mass transfer. Prerequisite: ME 419.

ME 486-490. TOPICS IN MECHANICAL ENGINEERING 3—0—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. Offered as announced. Prerequisite: Permission of instructor.

DEPARTMENT OF MILITARY SCIENCE

Colonel Wanovich (Head); Lieutenant Colonel Dawson; Major Drake; Captains Bissell, Cecalupo, Dorn, Pegg, Thompson and; Sergeant Major Allen; Master Sergeant Plummer; and Sergeant First Class Ammons.

MS 109. FOUNDATIONS OF OFFICERSHIP 2—0—1
Orients cadets to information and competencies that are central to a commissioned officer's responsibilities. Cadets will gain a basic understanding of Army values and culture, officership and leadership skills. Cadets will also learn time management, physical fitness and basic military skills. Cadets have the opportunity to attend one field training exercise, focusing on practical application of basics skills.

MS 110. INTRODUCTION TO LEADERSHIP 2—0—1
Continues the lessons of MS 109, with greater emphasis on the principles of ethical leadership. Cadets will continue to learn the basics of leadership in demanding tactical scenarios, and will practice basic military skills such as marksmanship, map reading and first aid. Cadets have the opportunity to attend one field training exercise, focusing on practical application of basic skills and teamwork in collective skills.

MS 209. INDIVIDUAL LEADERSHIP 2—0—1
Building on the first year of MS instruction, this course provided a greater focus on leadership skills. Cadets will learn both leadership theory and practical leadership techniques, with emphasis on planning, organizational and communication skills. Cadets will continue to learn and practice basic military skills such as physical fitness, marksmanship and land navigation. Cadets will learn of specific professional opportunities in the U.S. Army, and will learn the obligations of pursuing a commission. Cadets will have the opportunity to attend one field training exercise, focusing on practical application of military skills.

MS 210. LEADERSHIP AND TEAMWORK 2—0—1
Continues the lessons of MS 209, and prepares cadets for advanced studies in Military Science and Leadership. Greater emphasis is placed on applied leadership and team building. Cadets will continue to develop planning, organizational and communications skills, and will receive exposure to more complex concepts in Army doctrine. Cadets will have opportunities to practice individual leadership and teamwork in small groups during situational training exercises, and will also continue to hone basic military skills. By the end of the semester, cadets will be assessed for contracting in pursuit of an Army commission and competitively screened for attendance at a variety of U.S. Army training programs in the following summer. Cadets will have the opportunity to attend one field training exercise, focusing on individual competence and teamwork in collective skills.

MS 309. LEADERSHIP AND PROBLEM SOLVING 1—0—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. Prerequisite (only for contracted cadets): MS 109, 110 and MS 209, MS 210, or graduation from U.S. Army Cadet Command's Leader Training Course, or waiver from the Professor of Military Science. Corequisite: MS 319 (for contracted cadets), or LS 350 (for non-contracted cadets).

MS 310. LEADERSHIP AND ETHICS 1—0—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. Prerequisite (only for contracted cadets): MS 309, or waiver from the Professor of Military Science. Corequisite: MS 320, or waiver from the Professor of Military Science. Corequisite: MS 320 (for contracted cadets), or LS 351 (for non-contracted cadets).

MS 319/320. MS LAB 0—3—0

The MS Lab focuses on the practical application of the subjects taught in the classroom during MS 309-310. 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. These laboratory courses are companions to the MS 309 and 310 classes, 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 350/351).

MS 409. LEADERSHIP AND MANAGEMENT 1—0—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. Prerequisite (only for contracted cadets): MS 309-310, or waiver from the Professor of Military Science. Corequisite: MS 419 (for contracted cadets), LS 450 (for non-contracted cadets) or MS 319 (LDAC bound, commission seeking cadets).

MS 410. OFFICERSHIP 1—0—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. Prerequisite (only for contracted cadets): MS 409, or waiver from the Professor of Military Science. Corequisite: MS 420 (for contracted cadets), LS 451 (for non-contracted cadets) or MS 320 (LDAC bound, commission seeking cadets).

MS 419/420. ADVANCED MS LAB 0—3—0

The Advanced MS Lab focuses on the practical application of the subjects taught in the classroom during MS 409/410. 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. These laboratory courses are companions to the MS 409 and 410 classes, 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 450/451).

MS 429. LEADERSHIP AND PROBLEM SOLVING

This is the first course in the advanced MSL program, specifically designed to prepare cadets for their first 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. Prerequisite: only for contracted first class cadets.

MS 430. LEADERSHIP AND ETHICS

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. Prerequisite: only for contracted first class cadets.

MS 439/440. MS LAB

The MS Lab focuses on the practical application of the subjects taught in the classroom during MS 429-430. 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. These laboratory courses are companions to the MS 429 and 430 classes, and all contracted cadets must take the appropriate lab section simultaneously with those classes each semester.

DEPARTMENT OF MODERN LANGUAGES AND CULTURES

Brigadier General Farrell; Colonels Bulger-Barnett (Head), Cerkey, Sunnen and Dellinger; Major Youngdahl; Drs. Taifi, Naoui- Khir, Faundez-Reitsma; Ms. Bentouhami, Ms. Hardin, Ms. Yamagami and Ms. El-Shazli.

1. 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, their previous high school language coursework, and after consultation with the department head of modern languages.

2. 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.

3. Classroom work is supplemented with computer-aided language instruction in a well-equipped Language Learning Center.

Prerequisites: 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 201/203, and in ML 201/203 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 three or more 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.

INTERNSHIP (for all languages)

ML 311. MODERN LANGUAGE AND CULTURE INTERNSHIP 0—0—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. Prerequisites: 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 and 356.

ML 455 and 456. SUMMER RESEARCH IN MODERN LANGUAGES AND CULTURES (3 credits each)

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-, French-, German-, Spanish-, and Japanese-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. Prerequisites: 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.

ML498. READING FOR THE HONORS THESIS IN MODERN LANGUAGES AND CULTURES 3—0—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 0—0—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: successful completion of ML 498.

ARABIC

AR 101. ELEMENTARY ARABIC I 3—0—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 3—0—3

A continuation of AR 101. Prerequisite: AR 101.

AR 201. INTERMEDIATE ARABIC 3—0—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 AR 102.

AR 202. INTERMEDIATE ARABIC 3—0—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: AR 201.

AR 301W. ARABIC COMPOSITION AND CONVERSATION 3—0—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 AR 202.

AR 302W. ARABIC COMPOSITION AND CONVERSATION 3—0—3

A continuation of AR 301W. Prerequisite: AR 301W.

AR 314. ARABIC CIVILIZATIONS AND CULTURES 3—0—3

A survey of the history, literature, educational systems and values of the Arab World. 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 301 and AR 302. It is also intended to enhance cadets' cultural awareness of contemporary issues, which affect the Arabic speaking world and the United States. Prerequisite: AR 301, AR 302.

AR 315. ARABIC FOR THE MEDIA 3—0—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: Two AR 300's.

AR 316. TOPICS IN ARABIC 3—0—3

Information and discussion of diverse topics from the Arabic-speaking world. The principal language of instruction is Arabic. Prerequisite: Two AR 300's. Retakes for credit.

AR 405. INDEPENDENT READINGS 3—0—3

Directed readings of major literary works. Conducted almost exclusively in Arabic. Prerequisite: Completion of at least 9 hours beyond AR 202 or permission of the instructor and department head. Retakes for credit.

AR 407. ADVANCED ARABIC GRAMMAR AND SYNTAX 3—0—3

A systematic study of Arabic grammar and syntax. Emphasis also on vocabulary development and study of idiomatic expression. Prerequisite: Two AR 300's.

AR 408. ARABIC LITERATURE OF THE 19TH CENTURY 3—0—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: Two AR 300's.

AR 409. ARABIC LITERATURE OF THE 20TH CENTURY 3—0—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: Two AR 300's.

AR 410. ADVANCED ARABIC 3—0—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: Two AR 300s.

AR 418. ARABIC FOR BUSINESS 3—0—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 countries will provide cadets with a general cultural background of Arabic countries. Prerequisite: Two AR 300's.

AR 420. ARABIC POETRY 3—0—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: Two AR 300s.

AR 450. MODERN LANGUAGE CAPSTONE COURSE 3—0—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

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. Prerequisites: Two AR 300s.

AR 481. SURVEY OF MOROCCAN CULTURE AND SOCIETY**3—0—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.

FRENCH**FR 101. ELEMENTARY FRENCH****3—0—3**

An introduction to the fundamentals of French. Primary emphasis on the acquisition of the basic language skills (comprehending, speaking, reading, and writing) within the context of culture and civilization. Secondary emphasis on the cultures where French is spoken. Intended for beginners with no previous experience in the language.

FR 102. ELEMENTARY FRENCH**3—0—3**

A continuation of FR 101. Integration of French culture through cognitive reading and broader vocabulary. Prerequisite: FR 101.

FR 201. INTERMEDIATE FRENCH**3—0—3**

Reviews principles of grammar and expands the student's conversational skills within a cultural content. In addition, written work in French and the reading of significant French texts are required. Prerequisite: FR 102.

FR 202. INTERMEDIATE FRENCH**3—0—3**

A continuation of FR 201. Intensive saturation exercises, civilization and culture, daily writing, language lab. Prerequisite: FR 201.

FR 304. FRENCH COMPOSITION AND CONVERSATION**3—0—3**

Emphasis on fluency, phonetics, oral structures, and colloquial French and modern forms of written French. Sources include film, popular music, news broadcasts, native guest speakers, interviews and access to contemporary French as spoken and written. Prerequisite: French 202.

FR 305W and FR 306W. FRENCH THOUGHT ACROSS THE CENTURIES**3—0—3****3—0—3**

Survey of French contributions to philosophy, history, science, political theory and *belles-lettres* from the Middle Ages, to the Existential writers of the XXth Century. Cadets will consider all genres, poetry, narrative, exposition, drama as well as the evolution of the language itself. A Writing-Intensive Course requiring regular submission of written compositions and the regular re-writing and editing of such material. Prerequisite: French 202.

FR 314. FRENCH CIVILIZATIONS AND CULTURES**3—0—3**

Overview of history, art, politics, geography, educational and legal systems, reigning philosophy, ethos and mood of the French-speaking world, notably the former colonies of Indochina, Africa, the Caribbean (the DOM-TOM) and Québec, each with its culture derived from but independent of continental France. Texts include newspapers, popular media, personal and official documents, literary expression, and film. Enhances cultural awareness and prepares for study abroad in a nation where French is spoken. Spoken and written French exercised. Prerequisite: French 202.

FR 315. INTRODUCTION TO FRANCOPHONIC TEXTS**3—0—3**

A course designed to build 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. The language of instruction will be French. Emphasis placed on developing good reading and writing skills. Prerequisite: FR 202.

FR 330. FRENCH MASTERPIECES IN TRANSLATION I**3—0—3**

Survey of French contributions to philosophy, history, science, political theory, and *belles-lettres* from the Middle Ages to the Revolution, designed for students with no knowledge of the French language. The course will include origin and development of the *genres*: poetry, narrative, exposition, drama. Regular submission of written compositions in English and the regular re-writing and editing of such material. This course follows the outline of French 305W though availability of readable translations dictates the choice of texts. This course does not include a foreign language component and cannot be used toward a language requirement. Prerequisite: WR 102 with a minimum grade of C. Cadets may not earn credit for both FR 330 and FR 305W.

FR 331. FRENCH MASTERPIECES IN TRANSLATION II**3—0—3**

Survey of French contributions to philosophy, history, science, political theory, and *belles-lettres* from Romanticism to the present, designed for students with no knowledge of the French language. The course will include continued development of the *genres*: poetry, narrative, exposition, drama. Regular submission of written compositions in English and

the regular re-writing and editing of such material. This course follows the outline of French 306W though availability of readable translations dictates the choice to texts. This course does not include a foreign language component and cannot be used toward a language requirement. Prerequisite: WR 102 with a minimum grade of C. Cadets may not earn credit for both FR 331 and FR 306W.

FR 405 and FR 406. INDEPENDENT READING**3—0—3**

Directed readings of major literary works not included in other courses. Topics vary with student and faculty interests. Conducted in French. At least one research paper is required. Prerequisite: permission of the Department Head. Retakes for credit.

FR 409. STYLISTICS IN FRENCH**3—0—3**

Recapitulation of grammar with emphasis on expansion of vocabulary, development of style in speaking and writing, use of French for purposes other than literary. Materials used will be film, journalism, exposition, interviews, broadcast media, and other sources. Cadets will be expected to generate regular written material incorporating lessons learned and to deliver regular oral presentations focusing on fluid, colloquial communication of increasingly sophisticated subject matter. Prerequisite: Two French courses at 300-level.

FR 410. NARRATIVE AND EXPOSITION IN FRENCH**3—0—3**

A systematic study of narration in French, from Medieval epics and other early French story-telling and exposition through the essays of Montaigne and the evolution of the novel at the hands of innovators like Flaubert, Shendhal, Robbe-Grillet, Perec. Political theory and philosophical and scientific writings as well as tracts by moralists like Pascal or Descartes supplement purely fictional accounts. Extensive reading and analytical writing about these documents. Prerequisite: Two French courses at 300-level.

FR 411. DRAMA AND FILM IN FRENCH**3—0—3**

A systematic study of dramatic modes in French, from Medieval embellishments of the Mass through the Neo-Classical development of dramatic poetry to the modern *théâtre de l'absurde* and into the XXth Century. Extensive use of film versions of plays under study. Extensive reading and analytical writing about these documents. Prerequisite: Two French courses at 300-level.

FR 412. FRENCH POETRY AND POPULAR MUSIC**3—0—3**

A systematic study of French verse, from the earliest macaroniques and lyrical forms of the Middle Ages through the Classical forms of the Renaissance and XVIIth Century to more modern manifestations of poetry: *vers libres*, *symbolisme*, *l'art pour l'art*. Study of the representative poets of these movements and later of popular song and its most famous composers (Brel, Piaf, Gainsbourg, Vian). A study of prosody or versification will be necessary. Extensive reading and analytical writing about these documents. Prerequisite: Two French courses at 300-level.

FR 413. FRANCOPHONE OR NON-CONTINENTAL FRENCH**3—0—3**

A systematic study of expression in French, the result of French colonial expansion and its aftermath, including works from (the *Maghreb*), Black Africa, Indochina, Canada and Louisiana, and the Caribbean Basin. Focus on liberation of colonial peoples and their persistent loyalty to elements of French culture and civilization through the continued use of the language of French to capture their aspiration, their inspiration, and their frustration. Extensive reading and analytical writing about these documents. Prerequisite: Two French courses at 300-level.

FR 414. THEMES, FIGURES, PERIODS, REGIONS**3—0—3**

Detailed study of a given theme, in French culture, society, or history (colonialism, revolution, race, proto-science, economic and political theory), a given author through study of all his or her works (Beauvoir, Duras, Gide St-Expupéry, Joan of Arc, Napoleon), a period of innovation in theory of creation (Symbolism, Existentialism, Renaissance, Exploration), or an area of particular interest (French Caribbean). Extensive reading and analytical writing about these documents. Prerequisite: Two French courses at 300-level.

FR 450. MODERN LANGUAGE CAPSTONE COURSE**3—0—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 470. ADVANCED FRENCH**3—0—3**

Designed to improve comprehension of written and spoken French. Includes study of literary and non-literary readings. Prerequisite: Two French 300-level courses. Retake for credit.

GERMAN**GR 101. ELEMENTARY GERMAN****3—0—3**

An introduction to the fundamentals of German. Primary emphasis on the acquisition of the basic language skills (comprehension, speaking, reading, and writing) within the context of civilization and culture. Secondary emphasis on the cultures where German is spoken. Intended for beginners with no previous experience in the language.

GR 102. ELEMENTARY GERMAN**3—0—3**

A continuation of GR 101. Prerequisite: GR 101.

- GR 201. INTERMEDIATE GERMAN** 3—0—3
Reviews principles of grammar and expands the student's conversational skills. This course is intended to consolidate the basic language skills and to prepare the student for advanced work in German. Readings based on civilization and culture. Prerequisite: GR 102.
- GR 202. INTERMEDIATE GERMAN** 3—0—3
A continuation of GR 201. Prerequisite: GR 201.
- GR 303W. INTRODUCTION TO CONTEMPORARY GERMAN CULTURE** 3—0—3
A study of contemporary German issues including cultural events, travel, economy, politics, education, transportation, and public opinion. Prerequisite: GR 202. Writing Intensive (W).
- GR 304W. INTRODUCTION TO CONTEMPORARY GERMAN CULTURE II** 3—0—3
A study of contemporary German issues focusing on economy and German for business. Prerequisite: GR 202. Writing Intensive (W).
- GR 307. LITERATURE SURVEY (1100-1700)** 3—0—3
Authors and works include: the *Nibelungenlied*, Hartmann von Aue, Martin Luther, Hans Sachs, Andreas Gryphius and others. Prerequisite: GR 202.
- GR 308. LITERATURE FROM THE ENLIGHTENMENT TO REVOLUTION** 3—0—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: GR 202.
- GR 316. TOPICS IN GERMAN** 3—0—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. Prerequisite: GR 202. Retakes for credit.
- GR 405 and GR 406. SEMINAR IN GERMAN LITERATURE** 3—0—3
Advanced study of selected topics in German literature. Offered on demand. Conducted in German. Prerequisites: permission of the department head.
- GR 411. VIENNA, BERLIN, AND BETWEEN: GERMANY AND AUSTRIA FROM 1911-1950** 3—0—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: 6 hours of 300 level German.
- GR 412. GERMAN ON BOTH SIDES OF THE IRON CURTAIN** 3—0—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: 6 hours of 300 level German.
- GR 413. GERMANY AND THE MILITARY** 3—0—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: 6 hours of 300 level German.
- GR 420W. ADVANCED CONVERSATION AND COMPOSITION** 3—0—3
Students examine, discuss, and debate current events of political and military topics, such as the restructuring and deployment of the Bundeswehrt and Germany's role in the European Union. E-portfolios will constitute an important part of this course. Prerequisite: 6 hours of 300 level German. Writing Intensive (W).
- GR 421. IMMIGRATION TO AND FROM GERMANY SINCE 1850** 3—0—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: 6 hours of 300 level German.
- GR 450. MODERN LANGUAGE CAPSTONE COURSE** 3—0—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.

JAPANESE

- JP 101. ELEMENTARY JAPANESE** 3—0—3
An introduction to the fundamentals of Japanese. 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 of Japan. Intended for beginners with no previous experience in the language.
- JP 102. ELEMENTARY JAPANESE** 3—0—3
A continuation of JP 101. Prerequisite: JP 101.

- JP 201. INTERMEDIATE JAPANESE** 3—0—3
A continuation and systematic review of structural principles and an introduction to the reading and discussion of authentic materials and cultural texts with the aim of improving the four basic language skills. Conducted as much as possible in Japanese. Prerequisite: JP 102.
- JP 202. INTERMEDIATE JAPANESE** 3—0—3
A continuation of JP 201 with emphasis on writing. This course is intended to consolidate the basic language skills and to prepare the student for advanced work in Japanese. Conducted as much as possible in Japanese. Readings based on civilization and cultures. Prerequisite: JP 201.
- JP 301. JAPANESE COMPOSITION AND CONVERSATION** 3—0—3
Designed to improve students' spoken and written command of Japanese. Discussions, oral reports, and writing assignments include topics in Japanese culture and civilization. Conducted mainly in Japanese. Prerequisite: JP 202.
- JP 302. JAPANESE COMPOSITION AND CONVERSATION** 3—0—3
A continuation of JP 301. Prerequisite: JP 301.
- JP 370. SPECIAL TOPICS IN JAPANESE** 3—0—3
Prerequisite: JP 202. Retakes for credit.
- JP 450. MODERN LANGUAGE CAPSTONE COURSE** 3—0—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.
- JP 470. ADVANCED JAPANESE** 3—0—3
Designed to improve comprehension of written and spoken Japanese. Includes study of literary and non-literary readings. Prerequisite: JP 302 and one other 300 level class. Retakes for credit.
- JP 471W. A CONTINUATION OF JP 470** 3—0—3
A continuation of JP 470. Designed to improve comprehension of written and spoken Japanese. Literary and non-literary works studied. Prerequisite: JP 302 and one other 300 level class. Retakes for credit. Writing Intensive (W).
- SPANISH**
- SP 101. ELEMENTARY SPANISH** 3—0—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** 3—0—3
A continuation of SP 101. Prerequisite: SP 101.
- SP 201. INTERMEDIATE SPANISH** 3—0—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: SP 102.
- SP 202. INTERMEDIATE SPANISH** 3—0—3
A continuation of SP 201. Prerequisite: SP 201.
- SP 203. INTERMEDIATE SPANISH FOR BUSINESS** 3—0—3
An introduction to business and commercial Spanish. Includes the same systematic review of grammar and generic communicative vocabulary presented in SP 201. A study of simple Spanish texts relevant to business and management practices as well as general social aspects of the Spanish-speaking world provides a cultural and technical background. Prerequisite: SP 102.
- SP 204. INTERMEDIATE SPANISH FOR BUSINESS** 3—0—3
A continuation of SP 203. Students who successfully complete SP 204 will receive credit for fourth-semester Spanish (equivalent to SP 202). Prerequisite: SP 201 or SP 203.
- SP 299X. SUMMER ABROAD IN SPAIN** 3—0—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. It is only offered in some summers. Prerequisite: None. Civilizations and Cultures (X).
- SP 303W. SPANISH COMPOSITION AND CONVERSATION** 3—0—3
Designed for students who wish to gain a command of spoken and written Spanish. Conducted in Spanish. Prerequisite: SP 202 or SP 204. Writing Intensive (W).

- SP 305. SURVEY OF SPANISH LITERATURE** 3—0—3
A survey of Peninsular Spanish literature from the beginning through the 17th century, with selected readings from the major authors, literary movements, and genres. Conducted in Spanish. Prerequisite: SP 202 or SP 204.
- SP 306. SURVEY OF SPANISH AMERICAN LITERATURE** 3—0—3
A survey of Spanish American literature with selected readings from the major authors, literary movements, and genres. Conducted in Spanish. Prerequisite SP 202 or SP 204.
- SP 307W SPANISH FOR RESEARCH** 3—0—3
An introductory course in research methods for Spanish majors or minors. Emphasis on research methodology using both Spanish- and English-language materials and the production of a full-length research paper. Cadets will be introduced to academic writing in Spanish and methods of publication in languages and literatures. Conducted in Spanish. Prerequisite: one 300-level course. Writing Intensive (W).
- SP 311WX. HUMAN RIGHTS AND THE HISPANIC WRITER** 3—0—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: Completion of SP 202 or SP 202X, SP 204 or SP 204X and completion of WR 102 with a minimum grade of C. Writing Intensive (W), Civilizations and Cultures (X).
- SP 312. CULTURE AND CIVILIZATION OF SPAIN** 3—0—3
A study of Spain's cultural identity from prehistoric to contemporary times. By examining artistic, literary, political, and societal artifacts, the course explores the events and attitudes that have molded the idea of *españolismo* both within and beyond the Peninsula. Conducted in Spanish. Prerequisite: SP 202 or SP 204.
- SP 313. ADVANCED SPANISH GRAMMAR** 3—0—3
A systematic 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: Completion of SP 202 or SP 204.
- SP 314. LATIN AMERICAN CULTURES AND CIVILIZATIONS** 3—0—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. Conducted in Spanish. Prerequisite: SP 202 or SP 204.
- SP 315. INTRODUCTION TO HISPANIC TEXTS** 3—0—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. Conducted in Spanish. Emphasis will be placed on reading and writing skills. Prerequisite: SP 202 or SP 204.
- SP 316. TOPICS IN SPANISH** 3—0—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 the language skills of all cadets enrolled. The language of instruction is Spanish. Prerequisite: SP 202 or SP 204. Retakes for credit.
- SP 318. NOBEL LAUREATES** 3—0—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. Taught in Spanish. Prerequisite: SP 202 or SP 204.
- SP 320W. SPANISH GOTHIC LITERATURE** 3—0—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: SP 202 or SP 204. Writing Intensive (W).
- SP 322. HISPANIC CINEMA** 3—0—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: SP 202 or SP 204.
- SP 387. THE SPANISH CIVIL WAR AS TEXT (IN ENGLISH)** 3—0—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. Prerequisite: WR 102 with a minimum grade of C. Cadets may not earn credit for both SP 387 and SP 388.
- SP 388. THE SPANISH CIVIL WAR AS TEXT** 3—0—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. Prerequisite: SP 202 or SP 204 and WR 102 with a minimum grade of C. Cadets may not earn credit for both SP 387 and SP 388.
- SP 399X. SUMMER ABROAD IN SPAIN** 3—0—3
A summer cultural immersion study in Spain that includes language instruction at the post-intermediate level. Instruction and coursework are in Spanish. It is only offered in some summers. Prerequisite: SP 202 or SP 204. Civilizations & Cultures (X).
- SP 402. SPANISH LITERATURE OF THE SIGLO DE ORO** 3—0—3
An introduction to the poetry, prose, and comedia of Spain's Golden Age. Conducted in Spanish. Research paper required. Prerequisites: two 300-level courses or their equivalent.
- SP 405 and SP 406. READINGS IN HISPANIC LITERATURE** 3—0—3
3—0—3
Directed readings of major literary works; written reports and a research paper required. Conducted in Spanish. Prerequisite: permission of the department head. Retakes for credit.
- SP 409. EARLY SPANISH LITERATURE** 3—0—3
A study of medieval Spanish poetry and prose, with an introduction to drama. Conducted in Spanish. Research paper required. Prerequisites: two 300-level SP courses.
- SP 411. 19TH CENTURY PENINSULAR LITERATURE** 3—0—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. Conducted in Spanish. Prerequisite: two 300 level SP courses.
- SP 421. COLONIAL SPANISH AMERICAN LITERATURE** 3—0—3
A study of important Spanish American authors from the conquest to independence. Conducted in Spanish. Research paper required. Prerequisites: two 300-level SP courses.
- SP 422. SPANISH AMERICAN LITERATURE OF THE 19TH CENTURY** 3—0—3
Literary and philosophical trends from the independence movement to Modernism. Conducted in Spanish. Research paper required. Prerequisites: two 300-level SP courses.
- SP 423. SPANISH AMERICAN LITERATURE OF THE 20TH CENTURY** 3—0—3
Reading and analysis of representative works of the principal Spanish American novelists, poets, and dramatists from Modernism to the present. Conducted in Spanish. Research paper required. Prerequisites: two 300-level SP courses.
- SP 425. CERVANTES** 3—0—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. Conducted in Spanish. Research paper required. Prerequisites: two 300-level SP courses.
- SP 426. CONTEMPORARY SPANISH LITERATURE I** 3—0—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. Conducted in Spanish. Research paper required. Prerequisites: two 300-level SP courses.
- SP 427. CONTEMPORARY SPANISH LITERATURE II** 3—0—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. Conducted in Spanish. Prerequisite: Two 300-level SP courses.
- SP 428. US LATINO LITERATURE** 3—0—3
A study of the literature and culture of the Latino community in the United States. Readings reflect both the linguistic and cultural particularities of the various demographic groups that comprise the U.S. Latino population. Conducted in Spanish. Prerequisite: two 300-level courses.
- SP 450. MODERN LANGUAGE CAPSTONE COURSE** 3—0—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**
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. Prerequisites: two 300-level courses or their equivalent.

DEPARTMENT OF NAVAL SCIENCE

Colonel Hough (Head); Commander Baca, USN, Lieutenants Teninty, Victorius, Christensen, Stinnette, USN; Major Craig, USMC, GYSGT Driver, USMC and Captain Keene.

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 with the concurrence of the cadet's curricular head.

NS 101. INTRODUCTION TO NAVAL SCIENCE 2—0—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.

NS 102. SEA POWER AND MARITIME AFFAIRS 2—0—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.

NS 203. LEADERSHIP AND MANAGEMENT 2—0—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.

NS 205. NAVIGATION 2—0—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: NS 211.

NS 206. EVOLUTION OF WARFARE I 2—0—2

Marine option. The purpose of the Evolution of Warfare course is to provide the student with a very basic understanding of the art and concepts 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 age of transition in the 17th century. The student will examine the interrelations of political, strategic, operational, tactical, and technical levels 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.

NS 211. NAVIGATION LAB 0—1—0

Navy option. Students demonstrate their ability to use skills learned in NS 205 for practical application. Corequisite: NS 205

NS 303. AMPHIBIOUS WARFARE 2—0—2

Marine option. The purpose of Amphibious Warfare examines the principles of warfighting from the perspective of amphibious warfare. Amphibious Warfare will cover the time period from Marathon through current amphibious operations. Special emphasis is placed on the WWII period and the many amphibious operations conducted in both the European and Pacific Theaters. 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.

NS 304. AMPHIBIOUS WARFARE II 2—0—2

Marine option. A continuation of studies from Amphibious Warfare I, the class begins with the examination of the draw down of the military, specifically the Marine Corps, and the rapid build-up and deployments for the Korean War and Vietnam. The class continues through contemporary combat to include Operations Enduring Freedom and Iraqi Freedom. The students closely examine the evolution of amphibious doctrine tactics and equipment within the Marine Corps. The student will use the information provided in these classes to build a foundation of knowledge for decision making and action based historical reviews of amphibious operations. Corequisite NS 314 or LS 351.

NS 306. USMC SMALL UNIT LEADERSHIP, WEAPONS, AND TACTICS 2—0—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.

NS 308. NAVAL ENGINEERING 2—0—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: NS 318.

NS 309. NAVAL WEAPONS SYSTEMS 2—0—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.

NS 313. AMPHIBIOUS WARFARE LAB 0—1—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 principles learned in the core class. In addition, subject such as introductory Marine Corps customs and courtesies, leadership, traditions, and tactical decision games will supplement the learning environment.

NS 314. AMPHIBIOUS WARFARE II LAB 0—1—0

Marine option. The purpose of the lab is to provide Marine option midshipmen further understanding of the customs, courtesies, traditions, drill and ceremonies, small unit tactics and leadership principles that will give them the tools for success at their upcoming summer training in Quantico Virginia at Officer Candidate School. Only for Marine cadets on a commissioning track. Corequisite: NS 304.

NS 316. MARINE CORPS SMALL UNIT LEADERSHIP, WEAPONS, AND TACTICS LAB 0—1—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.

NS 318. NAVAL ENGINEERING LAB 0—1—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 selection. Corequisite NS 308.

NS 402. LEADERSHIP AND ETHICS 1—0—2

Navy and Marine option. A seminar on leadership principles and management techniques as they apply to the duties and responsibilities of junior officers. A strong foundation in ethics will be included. Corequisite: NS 412, NS 414, or LS 451.

NS 403. EVOLUTION OF WARFARE II 2—0—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 theory and nature of war from the Revolutionary Periods of the 18th and 19th centuries, through contemporary warfare and the possible future of warfare. Future Marine officers will examine the interrelations of political, strategic, operational, tactical, and technical levels 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: NS 413 or LS 450.

NS 408. NAVAL OPERATIONS AND SEAMANSHIP 2—0—2

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 NS 411 or LS 450.

NS 411. NAVY LEADERSHIP LAB I 0—1—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: NS 408.

NS 412. NAVY LEADERSHIP LAB II 0—2—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 NS 402.

NS 413. MARINE LEADERSHIP LAB I 0—2—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 Marine Operating Forces. 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: NS 403.

NS 414. MARINE LEADERSHIP LAB II 0—2—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 Marine Operating Forces. The course will address such topics as USMC and sister service mission and capabilities, operations and tactics, tactical decision making, and commissioning preparation. Corequisite NS 402.

***Cadets who are not seeking a contract or a commission must enroll in a Leadership and Management Development course (LS) instead of the NROTC lab (except for NS 211 Navigation Lab). Labs must be taken concurrently with the appropriate NROTC lecture course.**

DEPARTMENT OF PHYSICAL EDUCATION

Colonels Coale (Head) and Richardson; Majors Johnson and Sykes; Captain Joyce; Mr. Whitten and Ms. Dryden.

All cadets are required to take seven consecutive semesters of physical education classes and earn four semester credit hours (exclusive of PE 430) to meet graduation requirements. New cadets do not take a physical education class first semester of their rat year. Second semester of the 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. Each course has a physical fitness component, measured by a physical fitness test, which constitutes 25 percent of the final grade.

PE 100. BEGINNING SWIMMING 0—2—0.5
This course is for non-swimmers only.

PE 101. BASIC SWIMMING AND SURVIVAL 0—1—0.5
Stressed are the basic strokes, survival support, breath control skills, and pre-lifesaving skills.

PE 102. BOXING 0—1—0.5
Instruction in the fundamentals of boxing.

PE 200. DRUG AND ALCOHOL ABUSE AWARENESS 1—0—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.

PE 211. WRESTLING 0—1—0.5
Fundamentals of wrestling.

PE 300. PRINCIPLES OF PHYSICAL CONDITIONING 0—1—1
An elementary course in exercise physiology. (This class will be 1 hour for the Class of 2011 and beyond.)

PE 315. COMBATIVES 0—1—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. Prerequisites: PE 102 (Boxing) and PE 211 (Wrestling).

PE 320. DRUG AND ALCOHOL PROBLEMS 3—0—3
A study of the substances being abused — the effects, prevention, diagnoses, intervention, treatment, corporate strategies, laws.

PE 401. GOLF 0—1—0.5
A beginning course. Offered during fall semester only.

PE 402. LIFEGUARDING 0—1—0.5
Successful completion leads to certification as a lifeguard. Prerequisite: PE 304.

PE 403. ADVANCED SWIMMING AND SURVIVAL 0—1—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. Prerequisite: PE 101.

PE 404. C.P.R. 1—0—0.5
Successful completion confers American Red Cross certification. This course is a prerequisite for PE 103, Lifeguarding.

PE 405. DIETARY SUPPLEMENTS 1—0—0.5
Provides information on the benefits and detriments of common physical performance stimulants

PE 406. HANDBALL/RACQUETBALL 0—1—0.5
A beginning course.

PE 407. VOLLEYBALL 0—1—0.5
A beginning course.

PE 408. GYMNASTICS AND TUMBLING 0—1—0.5
Instruction and practice in both activities will be provided during spring semester only.

PE 409. TENNIS 0—1—0.5
A beginning course. Offered during fall semester only.

PE 411. WEIGHT TRAINING I: THEORY AND DESIGN 1—0—0.5
Fundamentals of weight lifting.

PE 412. WEIGHT TRAINING II: TRAINING APPLICATION 0—1—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 pre-determined **functional** lifting programs relative to all of the components (strength, power, endurance) of muscular development.

PE 413. HIGH INTENSITY PHYSICAL TRAINING 0—1—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.

PE 414. BASKETBALL 0—1—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.

PE 430. HEALTH EDUCATION 3—0—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.

DEPARTMENT OF PHYSICS AND ASTRONOMY

Colonels Thompson (Head) and Vargas; Lt. Cols. Brooke, D. Topasna, G. Topasna; and Mr. Allen.

Requirements for a major in physics are specified on page 67.

*Satisfies core curriculum science requirement.

ASTRONOMY

AT 201. INTRODUCTORY ASTRONOMY: THE SOLAR SYSTEM 3—0—3
An introductory course examining astronomical concepts in the solar system, starting with constellations and orientation of the night sky. Topics will include observational methods and telescopes, orbits and origins of planets, comets, meteors, and recent discoveries from planetary space probes. The observatory's 20-inch reflecting telescope will be utilized to observe the planets and other celestial objects. (Offered in the fall semester only.) Offered every other year in fall.

AT 204. INTRODUCTORY ASTRONOMY: STARS, GALAXIES, AND THE UNIVERSE 3—0—3
An introductory course intended to provide a factual and conceptual basis for an appreciation of the scale and structure of the universe. Topics will include stars, pulsars, black holes, quasars, the structure of our galaxy, and cosmology. The observatory's 20-inch telescope will be used to observe and photograph these celestial objects. (Offered in the spring semester only.) Offered every other year in spring.

AT 301. OBSERVATIONAL TECHNIQUES 3—2—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.) Prerequisites: AT 201 or AT 204 or permission of the instructor. Offered every other year in fall.

AT 306. INTRODUCTORY ASTROPHYSICS 3—0—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. Prerequisites: PY 161 and AT 201 or AT 204 or consent of the instructor. Offered every other year in spring.

PHYSICS

PY 115. LABORATORY FOR PY 120 0—2—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: PY 120.

PY 116. LABORATORY FOR PY 121 0—2—1
A laboratory course to investigate the concepts covered in PY 202. Computer generated graphs, spreadsheets, and regression analysis are required for most experiments. Corequisite: PY 121.

PY 120. GENERAL PHYSICS I 3—0—3
PY 121. GENERAL PHYSICS II 3—0—3
Designed as a terminal course in physics for non-science majors, this sequence is a survey of the concepts and theories of classical and modern physical science. (Not recommended for mathematics or science majors.) Prerequisite: PY 120.

PY 155. LABORATORY FOR PY 160 * 0—2—1
A laboratory course to investigate the concepts covered in PY 160. Computer generated graphs, spreadsheets, and regression analysis are required for most experiments. Corequisite: PY 160.

PY 156. LABORATORY FOR PY 161 * 0—2—1
A laboratory course to investigate the concepts covered in PY 161. Computer generated graphs, spreadsheets, and regression analysis are required for most experiments. Corequisite: PY 161.

PY 160. GENERAL PHYSICS I * 3—0—3
Prerequisite: Proficiency in MA 123.

PY 161. GENERAL PHYSICS II * 3—0—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. Prerequisites: Proficiency in PY 108 or PY 160.

PY 220. PHYSICS SEMINAR 1—0—1
This course is designed to acquaint students with topics in physics that are being actively investigated. The topics covered will vary depending on current news within the physics community as well as the interest of the enrolled students but may include relevant topics such as Bose-Einstein condensates, string theory and quantum dots. Students will be required to read articles, give short presentations and write summaries of the topics covered. As this course is intended to be survey in nature, topics will not be covered in depth and mathematical analysis will not be emphasized.

PY 223. PROGRAMMING AND DATA ANALYSIS 1—2—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 238. LABORATORY TECHNIQUES 1—2—2
An introduction to analog electronics and associated laboratory techniques and instruments.

PY 253W. OPTICS LABORATORY 0—2—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: PY 161. Co-requisite PY 254. Writing Intensive (W).

PY 254. OPTICS 3—0—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: Either PY 203 or PY 161.

PY 257. ELECTRONICS AND INTERFACING 3—2—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.

PY 291-294. SUMMER RESEARCH IN PHYSICS 0—2—1 to 0—8—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. Prerequisites: permission of the department head and faculty research mentor.

PY 308. INTRODUCTION TO NANOTECHNOLOGY 3—0—3
A course designed to introduce the student to the multidisciplinary and rapidly developing field of nanotechnology. Topics include nanomaterials, micro/naofabrication, microscopy, nanoelectronics, biological nanotechnology, nanotorrism, social and ethical implications, etc. Prerequisite: PY 160/PY 161 or PY 108/PY 203.

PY 331. INDEPENDENT PROJECT I 0—2—1
Each student works under the close supervision of a faculty member on an independent problem. This problem may include experimental or theoretical research in the conventional sense, or development of a new laboratory experiment, or another problem specified by the instructor.

PY 332. INDEPENDENT PROJECT II 0—2—1
A continuation of the work done in PY 331.

PY 333W. MODERN PHYSICS LABORATORY 0—2—1
A laboratory course to accompany PY 343, Modern Physics. Elementary experiments in both atomic and nuclear physics will be performed. Prerequisite, or Corequisite: PY 335. Writing Intensive (W).

PY 334. NUCLEAR PHYSICS LABORATORY 0—2—1
A laboratory course to accompany PY 344, Nuclear Physics. A number of more advanced nuclear physics laboratory experiments will be performed. Prerequisites: PY 333W and PY 335.

PY 335. MODERN PHYSICS I 3—0—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. Prerequisites: Either PY 203 or PY 161.

PY 336. MODERN PHYSICS II 3—0—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. Prerequisites: PY 335.

PY 341. ELECTRICITY AND MAGNETISM I 3—0—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: Either PY 203 or PY 161.

PY 342. ELECTRICITY AND MAGNETISM II 3—0—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: PY 341.

PY 344. NUCLEAR PHYSICS 3—0—3
Nuclear structure, nuclear models, decay processes, reaction cross-sections, reaction kinematics, neutron dynamics, nuclear reactors, radiation detectors, nuclear accelerators, particle physics. Prerequisites: PY 161.

PY 391-394. SUMMER RESEARCH IN PHYSICS 0—2—1 to 0—8—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. Prerequisites: permission of the department head and faculty research mentor.

PY 420. CAPSTONE I 1—2—2
The first course of a two-semester research experience. It will consist of a common hour in which material on the history and philosophy of physics and research methods are discussed, and two laboratory hours in which students pursue research projects with a faculty mentor.

PY 421. CAPSTONE II 0—2—1
The second course of a two-semester research experience, in which the student continues the research project begun in the first semester. Students will also prepare a final paper and presentation as part of this course.

PY 441. CLASSICAL MECHANICS I 3—0—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. Prerequisites: PY 108 or PY 160, MA 311.

PY 446. THERMAL PHYSICS 3—0—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: PY 335.

PY 447. THESIS I 0—2—1 to 0—8—4
PY 448. THESIS II 0—2—1 to 0—8—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 3—0—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. Offered when the enrollment justifies. Prerequisite: PY 203 or PY 161.

PY 459. INTRODUCTION TO QUANTUM MECHANICS 3—0—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. Prerequisites: PY 335 and MA 301.

PY 460. TOPICS IN QUANTUM MECHANICS 3—0—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. (Offered when the enrollment justifies.) Prerequisite: PY 459.

PY 481-489. TOPICS IN PHYSICS 3—0—3

Special topics in physics and astronomy as suggested by faculty or cadets. Subjects and content to be announced in advance. Course(s) will not necessarily be offered every semester. Prerequisite: first-class standing and permission of the department head.

PY 491-494. SUMMER RESEARCH IN PHYSICS 0—2—1 to 0—8—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. Prerequisites: permission of the department head and faculty research mentor.

DEPARTMENT OF PSYCHOLOGY AND PHILOSOPHY

Colonels Gire (Head), Meriwether, Eicher, and Barber; Lieutenant Colonel Kline; Majors Cotting, Frein and Sullivan; Doctors Arinder and Richter.

PHILOSOPHY

PH 201. HISTORY OF GREEK AND MEDIEVAL PHILOSOPHY 3—0—3

An introduction to philosophical thinking through the study of thought from the ancient Greeks to the Renaissance. As well as learning the history of ethical, religious, political and other ideas that continue to shape our civilization, cadets will learn to assess arguments critically and to construct rational defenses of their own beliefs.

PH 202. HISTORY OF MODERN PHILOSOPHY 3—0—3

An introduction to philosophical thinking through the study of thought from the Renaissance to the present day. As well as learning the history of ethical, psychological, political and other ideas that continue to shape our civilization, cadets will learn to assess arguments critically and to construct rational defenses of their own beliefs.

PH 204. APPLIED ETHICS 3—0—3

This elective course is an introduction to critical thinking about ethics through the examination of real-life moral and political problems such as abortion, euthanasia, and the legalization of drugs. It is less theoretical than Ethics (PH 304). Prerequisites: None.

PH 292 and PH 293. INDEPENDENT RESEARCH 3—0—3

These courses are for rising 2nd class cadets pursuing research during the summer. Permission of instructor and department head required.

PH 301. LOGIC 3—0—3

A systematic study of the methods and structure of classical logic, beginning symbolic logic, and scientific investigation. (This course is taught in the Mathematics Department.)

PH 304. ETHICS 3—0—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.

PH 307. COMPARATIVE RELIGION 3—0—3

A survey of the history, doctrines, and sacred writings of the world's major religions.

PH 308. MINDS AND MACHINES 3—0—3

Although it has no prerequisites, this course is intended primarily for students who have taken at least one philosophy course before. Some knowledge of psychology, electrical engineering,

or computer science will also be helpful. The course will survey the major issues and theories involved in the philosophy of intelligence, natural and artificial. Participants will examine the major current, competing ideas about what the mind is, what consciousness is, and whether a machine could have a mind. In doing so, cadets will be guided to address such questions as: Is the mind the soul? Is the brain the mind? What is the connection between mind and behavior? Is the brain a kind of computer? Could any machine have a real mind?

PH 309. PHILOSOPHY OF RELIGION 3—0—3

This elective course surveys some of the major analyses, criticisms, and defenses of religion. We will examine such questions as: What is religion? Why does it exist? Is it rational? Is genuine faith possible anymore?, and, Is religion something we could ever do without? This is not a course on world religions or comparative religion. The emphasis will be on philosophical questions about the rationality of belief in the existence of God, and the main examples of religious belief used will come from the Christian tradition. Prerequisites: Successful completion of a prior PH course or permission of instructor.

PH 390 and PH 391. INDEPENDENT RESEARCH 3—0—3

These courses are for 2nd class cadets pursuing research during the fall and/or spring semesters. Permission of instructor and department head required. Prerequisite: Permission of instructor and department head required.

PH 392 and PH 393. INDEPENDENT RESEARCH 3—0—3

These courses are for rising 1st class cadets pursuing research during the summer. Permission of instructor and department head required.

PSYCHOLOGY

(C or better is required in PS 201 for all upper level PS courses-starting with the Class of 2014)

PS 201. INTRODUCTION TO PSYCHOLOGY 3—0—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 203. BIOPSYCHOLOGY I 3—0—3

An introduction to neuroanatomy, physiology of neurons, effects of drugs, evolution of the nervous system, vision, nonvisual sensory systems, movement. Pre-requisite: PS 201.

PS 204. BIOPSYCHOLOGY II 3—0—3

A continuation of PS 203 to include wakefulness and sleep, internal regulation, sexual behavior, emotions, stress, learning and memory, cortical lateralization and language, recovery from brain injury, mood disorders and schizophrenia. Prerequisite: PS 201 and PS 203.

PS 290 and PS 291. INDEPENDENT RESEARCH 0—4—2

These courses are for third classmen pursuing research during the fall and/or spring semesters. Permission of instructor and department head required. Prerequisite: PS 201.

PS 292 and PS 293. INDEPENDENT RESEARCH 0—4—2

These courses are for rising second classmen pursuing research during the summer. Permission of instructor and department head required. Prerequisite: PS 201.

PS 301. PSYCHOLOGY OF LEARNING 3—0—3

The empirical and theoretical examination of learning and memory. Topics covered include conditioning, discrimination, short-term and long-term retention. Prerequisite: PS 201.

PS 302. SOCIAL PSYCHOLOGY 3—0—3

Behavior and experiences of the individual in society, group dynamics and social institutions, human relations, morale and leadership. Prerequisite: PS 201.

PS 304. EDUCATIONAL PSYCHOLOGY 3—0—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: PS 201.

PS 305. ABNORMAL PSYCHOLOGY 3—0—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: PS 201.

PS 306. HUMAN RESOURCE MANAGEMENT 3—0—3

A survey of principles and practices used by Human Resource and General Managers and the managed in their work situations. Most intensive study of the functions of selection and placement; training and development; compensation and benefits; employee and labor relations/communications, health, safety, and security. **Note:** Academic credit will not be given for both BU 322 and PS 306. PS 306 will not fulfill a liberal arts elective for EC-BU majors. Prerequisite: PS 201.

PS 307. DEVELOPMENTAL PSYCHOLOGY 3—0—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: PS 201 or permission of instructor.

PS 308. MOTIVATION 3—0—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 PS 201.

PS 313. FORENSIC PSYCHOLOGY 3—0—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 PS 201.

PS 315. THEORIES OF PERSONALITY 3—0—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: PS 201.

PS 316. PSYCHOLOGY INTERNSHIP 1—4—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 3—0—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. Prerequisites: PS 201 or permission of instructor.

PS 318. INTRODUCTION TO COUNSELING AND PSYCHOTHERAPY 3—0—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. Prerequisites: PS 201 or permission of instructor.

PS 319. CREATIVE AND CRITICAL THINKING 3—0—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. Prerequisites: PS 201 or permission of instructor.

PS 344. LEADERSHIP IN ORGANIZATIONS 3—0—3
A core curriculum course required of all cadets commencing with the Class of 2010. 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. Credit will not be awarded for both PS 344 and PS 303.

PS 390 and PS 391. INDEPENDENT RESEARCH 0—4—2
0—8—4
These courses are for second classmen pursuing research during the fall and/or spring semesters. Permission of instructor and department head required. Prerequisite: PS 201.

PS 392 and PS 393. INDEPENDENT RESEARCH 0—4—2
0—8—4
These courses are for rising first classmen pursuing research during the summer. Permission of instructor and department head required. Prerequisite: PS 201.

PS 401. PSYCHOLOGY OF COGNITION 3—0—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: PS 201.

PS 402W. RESEARCH METHODS IN PSYCHOLOGY 3—0—3
A laboratory course covering the principal areas of general and experimental psychology. Prerequisites: PS 201 and MA 307. Writing Intensive (W).

PS 403W. INDEPENDENT PROJECT 3—0—3
A continuation of PS 402W. Prerequisite: PS 402W. Writing Intensive (W).

PS 404. HISTORY AND SYSTEMS IN PSYCHOLOGY 3—0—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: PS 201. This course is restricted to First Class psychology majors.

PS 491. SUPERVISED RESEARCH I 0—2—1 to 0—6—3
PS 492. SUPERVISED RESEARCH II 0—2—1 to 0—6—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: PS 201. Permission of the department head.

PS 495W. INDEPENDENT PROJECT IN LEADERSHIP STUDIES 3—0—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. Prerequisites: PS 201, PS 344 and permission of the department head. Note: PS 495 is a required course for the minor in Leadership Studies and is writing intensive (W).

SPANISH

See Department of Modern Languages, page 100.

SPEECH

(Under Administrative Supervision of the Department of English and Fine Arts)

SE 300. PUBLIC SPEAKING 1—0—1
This course is designed to give students the skill and poise required to deliver a coherent, persuasive, and reasonably eloquent public speech. They will be required to deliver an oral interpretation, an informative speech, and an argument/persuasion speech and also offer critical analyses of their classmates' presentations.

WRITING

See Department of English and Fine Arts, page 87.

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2011-2012**

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MICHAEL D. TENINTY, Lieutenant, USN, Assistant Professor of Naval Science. B.A., Chapman University.

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ANTONY D. WHITEHEAD, Captain, USAF, Assistant Professor of Aerospace Studies. B.S., Aeronautical Technology, Embry-Riddle Aeronautical University.

LLOYD D. WELLS, Major, USA, Recruiting Officer.

KHAMA A. WODS, Staff Sergeant, USAF, Assistant NCOIC Personnel.

ADAM S. YOUNG, Captain, USMC, Junior Marine Officer Instructor. B.S., Worcester Polytechnic Institute.

THE VMI ALUMNI ASSOCIATION, INC.

Founded in 1842 on the day following the graduation of VMI's first graduating class, the VMI Alumni Association includes as members all VMI alumni who left the Institute under honorable circumstances. The current roster numbers more than 21,000 alumni in all 50 states and many parts of the world.

The purpose of the Alumni Association is "to organize the alumni in one general body, so as the better to keep alive the memories of Institutelife, and by their united efforts the more efficiently to aid in the promotion of the welfare of the Institute, and the successful prosecution of its education purposes in the future."

Among its programs, the Alumni Association assists the VMI Admissions Office by encouraging young men and women to apply for admission to the Institute and assists in providing job placement services to alumni. Moody Hall is operated to provide accommodations for alumni when returning to the Institute and for social occasions.

The VMI Alumni Review is published quarterly to inform the alumni of the state and progress of the Institute and to provide an archival record of the success of her alumni.

The VMI Foundation, Inc., the VMI Development Board, Inc., and the VMI Keydet Club, Inc., are the fund-raising arms of the VMI Alumni Association.

Officers are elected by the Board of Directors of the VMI Alumni Association. Those for 2010-2011 are:

President
Randolph M. Blanks '67 Woodbridge, Virginia

First Vice-President
Robert A. Heely '69 Norfolk, Virginia

Second Vice-President
Edgar J.T. Perrow, Jr. '96..... Lynchburg, Virginia

Historian:
Thomas W. Davis '64..... Lexington, Virginia

Executive Vice-President:
Adam C. Volant '88..... Lexington, Virginia

Vice President – Alumni Activities:
Carole B. Green..... Lexington, Virginia

Information Officer
Matthew J. Schwarzmann'90..... Lexington, Virginia

NCR- New Cadet Recruiting Officer
Nichole E. Kramer '03 Lexington, Virginia

Placement Officer
Eric J. Hunter '08..... Lexington, Virginia

NetCommunity Planner
Jennifer M. G. Palmer..... Lexington, Virginia

Executive Assistant
Lisla K. Danas..... Lexington, Virginia

Alumni Assistant
Diane M. Brown..... Lexington, Virginia

VMI ALUMNI REVIEW:

Editor
Hope L. Hennessey Lexington, Virginia

Assistant Editor
Traci L. Mierzwa..... Lexington, Virginia

Editorial Assistant
Brenda S. Stoner Lexington, Virginia

THE VMI DEVELOPMENT BOARD

The VMI Development Board was established in the spring of 1978 and incorporated in 1987 under the auspices of the VMI Alumni Association to implement a comprehensive development program and to coordinate the Institute's various fund raising activities. The composition of the Board of Directors is as follows: The President of the Board of Visitors, the Superintendent of VMI, the President of the VMI Alumni Association, the President of the VMI Foundation, the President of the VMI Keydet Club, and the Executive Director of the Development Board.

THE VMI KEYDET CLUB

Organized in 1934, the purposes of the Keydet Club are to support, strengthen, and develop the intercollegiate athletic program at VMI. These purposes are advanced by soliciting and receiving monetary gifts to the Keydet Club Scholarship Fund, which helps to finance grants-in-aid for the Institute's Division I athletes, and the Athletic Operations Fund. In return for their gifts, members of the Keydet Club are invited to special events and receive other benefits associated with VMI athletics. to be awarded to cadets and prospective cadets on the basis of athletic talent as well as possession of the educational and character qualifications needed by all cadets.

The Keydet Club also assists the Institute with fundraising for athletic facilities and other capital needs.

More information about the VMI Keydet Club is available on the World Wide Web at www.vmikeydetclub.com

The 2010-2011 officers are:

President:
William A. Paulette '69 Richmond, Virginia

First Vice-President
U. "Buzz" Birzenicks '64 Lexington, Virginia

Second Vice-President
Joseph W. Keyes, Jr. '82 Ashburn, Virginia

Secretary/Treasurer
Gerald J. Acuff, Jr. '71 Scottsdale, Arizona

Chief Executive Officer:
Gregory M. Cavallaro '84..... Lexington, Virginia

Vice President:
Donald S. Ross '74..... Lexington, Virginia

Vice President
Douglas P. Bartlett..... Lexington, Virginia

Assistant Vice-President- Development
J. Robert Crumpler..... Lexington, Virginia

Office Manager and Executive Assistant
Jackie R. Flint..... Fairfield, Virginia

THE VMI FOUNDATION, INC.

Founded in 1936, the VMI Foundation helps to raise and manage the private financial resources, directed for purposes other than athletics, which are necessary to ensure that VMI remains a first-rate intercollegiate academic institution and retains its extraordinary place in American higher education. In doing so, the Foundation combines vigorous fund-raising and careful stewardship and engages the enduring spirit of VMI's alumni, parents, and friends. The VMI Foundation also provides the funds necessary for the VMI Alumni Association to continue its work on behalf of the VMI Family. Annually, the combined development efforts of the Foundation, VMI Keydet Club, and the VMI Development Board provide millions of dollars in financial support to the Institute.

Officers and primary staff for 2010-2011 are:

President:

Walter C. Perrin, II '62 Atlanta, Georgia

Vice President/Administration:

Walton M. Jeffress '68 Fairfax, Virginia

Vice President/Fund Raising:

Robert Coptly '70 Roanoke, Virginia

Chief Executive Officer:

Brian S. Crockett Lexington, Virginia

Vice President Major Gifts:

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Terrie I. Conrad Appomattox, Virginia

Vice President Annual and Reunion Giving:

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Elizabeth A. Moore Lexington, Virginia

Director of Information Services:

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Corporate Secretary:

Frances W. Arehart Buena Vista, Virginia

Assistant Secretary/Treasurer:

Crissy Elliott Lexington, Virginia

The VMI Foundation's offices are located in Neikirk Hall at 304 Letcher Avenue. The mailing address is: P.O. Box 932, Lexington, Virginia 24450; the telephone number is 540-464-7287. Please visit the VMI Foundation's web page on the VMI Alumni Agencies' website: www.vmiaa.org.

The following are but a few of the many programs and activities supported through the funds raised and managed by the VMI Foundation, Inc.

CADET

Merit-based and need-based scholarships
Career development services
Graduate fellowships
Internships
Foreign study scholarships
Plays, concerts and speakers
Chaplain's Office
Clubs and club sports
Rat Challenge
Cadet awards
Cadet Investment Group

FACULTY

Institute Professorships
Professorial Chairs
Visiting scholars program
Professional development
Research
Salary supplements
Housing subsidies
Teaching and service awards
Departmental funds
Technology upgrades

ADMINISTRATION

Admissions
Public relations
Capital improvements
Property maintenance
Debt Service

ALUMNI

VMI Alumni Association Operations
New Cadet Recruiting
VMI Alumni Review
Moody Hall
Class Agents Program

OTHER

VMI Museum
McKethan Park
Preston Library
Parents Council

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 to all cadets and parents, then it has met its challenge.

The Parents Council meets formally twice a year on Parents Weekend and mid-winter at VMI. Council representatives regularly attend VMI events to answer questions and act as hosts and hostesses.

VMI RESEARCH LABORATORIES

The VMI Research Laboratories was established in 1963 as a private non-profit Virginia Corporation to encourage and promote faculty research. It fosters educational objectives by supporting scientific investigation and contractual research. Since cadets assist faculty members, activities of the Research Laboratories help to teach research techniques.

Policies of the Corporation are established and carried out by a 15-man Board of Directors. The Chairman of the Board is Colonel Victor J. Bernet, M.D. of Olney, Maryland and the Director of Research is Dr. Richard A. Rowe, Professor of Biology. During 2007-2008 twelve faculty members and several cadets were employed part-time on contracts totaling in excess of \$2,610,197 and dealing with areas including: chemoresponses, modeling of glass forming processes, wastewater treatment, thin films, glass chemistry, nuclear waste immobilization and analysis of leadership traits. During 2007-2008, grants from FMC Corporation, Research Corporation, VDOT, Jeffress Trust, Emhart Glass Research and various industry sources were awarded to VMI faculty and administered by the VMIRL. Sponsored events include the annual Environment Virginia Symposium and the Marr School. Recently, VMIRL co-sponsored the establishment of the Center for Glass Chemistry within the VMI Chemistry Department and the Journal of Undergraduate Research. The VMIRL administers the Stanley Wetmore Fund which provides monetary support for cadet research. The VMIRL sponsors two awards which are presented at the Institute's annual convocation. The Matthew Fontaine Maury and Wilbur S. Hinman awards each reward outstanding achievement in the area of faculty and cadet research efforts at the Institute.

MAY 2010 GRADUATES BY CURRICULUM

	Number Graduates	Distinguished Graduates
Biology	14	5
Chemistry	5	3
Civil Engineering.....	31	15
Computer Science.....	6	3
Economics-Business.....	26	9
Electrical/Computer Engineering.....	11	6
English	5	1
History	33	11
International Studies.....	47	17
Mathematics/Applied Mathematics.....	6	2
Mechanical Engineering	31	9
Modern Languages & Cultures.....	9	3
Physics	19	5
Psychology	4	1
Total	247	90

RECAPITULATION OF GRADUATES

Total to September 15, 2009.....	20,308
Graduated in 09-10 session.....	284
Total to September 15, 2010.....	20,592

ENROLLMENT SUMMARY Fall 2010

Opening enrollment for the 2010-2011 session included matriculation of 501 new cadets and registration of 1100 old cadets. Under guidelines of the State Council of Higher Education for Virginia, the figures below represent Corps strength (1569) as of the drop- add census date, September 13, 2010.

CLASS OF	2011	2012	2013	2014	TOTAL
Old Female Cadets.....	29	27	33	0	89
Old Male Cadets.....	349	297	364	1	1011
New Female Cadets.....	0	0	0	55	55
New Male Cadets.....	0	0	0	414	414
Total Female Cadets.....	29	27	33	55	144
Total Male Cadets.....	349	297	364	415	1425
Total Cadets.....	378	324	397	470	1569

CLASS OF	2011	2012	2013	2014	TOTAL
Applied Mathematics	4	7	4	11	26
Biology	22	25	29	36	112
Chemistry	10	7	17	14	48
Civil Engineering.....	41	20	41	48	150
Computer Science.....	7	5	9	9	30
Economics / Business.....	55	60	60	47	222
Electrical/Comp Engineering.....	11	5	12	20	48
English.....	17	22	7	5	51
History	53	33	49	44	179
International Studies	64	60	84	106	314
Mechanical Engineering	39	35	45	90	209
Modern Languages & Cultures... ..	12	4	4	9	29
Physics	2	4	4	11	21
Psychology	41	37	32	20	130
Total	378	324	397	470	1569

GEOGRAPHICAL DISTRIBUTION

CORPS OF CADETS – FALL 2010 (Based on state/nation of legal residence)

U.S. Cadets					
Legal Residence	2011	2012	2013	2014	Total
Alabama	1	2	1	2	6
Alaska	0	0	0	0	0
Arizona	1	2	1	0	4
Arkansas	0	1	0	0	1
California	17	7	11	14	49
Colorado	1	2	1	0	4
Connecticut	2	0	2	1	5
Delaware	0	2	1	0	3
District of Columbia	1	0	0	0	1
Florida	7	6	13	9	35
Georgia	10	10	10	8	38
Hawaii	0	2	0	0	2
Idaho	0	0	1	0	1
Illinois	1	3	2	6	12
Indiana	4	2	3	2	11
Iowa	1	0	1	0	2
Kansas	1	0	1	2	4
Kentucky	0	4	2	4	10
Louisiana	1	0	0	1	2
Maine	0	0	4	1	5
Maryland	11	18	15	15	59
Massachusetts	4	4	7	10	25
Michigan	0	1	3	3	7
Minnesota	0	1	0	0	1
Mississippi	0	0	0	1	1
Missouri	0	1	0	3	4
Montana	0	1	0	0	1
Nebraska	0	0	1	1	2
Nevada	0	0	1	1	2
New Hampshire	2	0	0	3	5
New Jersey	8	5	8	6	27
New Mexico	0	0	0	0	0
New York	6	8	14	10	38
North Carolina	12	17	21	27	77
Ohio	6	3	6	6	21
Oklahoma	0	0	0	0	0
Oregon	0	0	1	0	1
Pennsylvania	9	9	15	17	50
Rhode Island	0	0	0	1	1
South Carolina	2	3	1	3	9
Tennessee	3	3	6	5	17
Texas	4	10	8	10	32
Utah	0	1	0	0	1
Vermont	0	0	0	0	0
Virginia	247	185	223	283	938
Washington	2	0	2	4	8
West Virginia	6	1	3	3	13
Wisconsin	0	0	0	0	0
Wyoming	1	0	0	0	1
TOTAL	371	314	389	462	1536

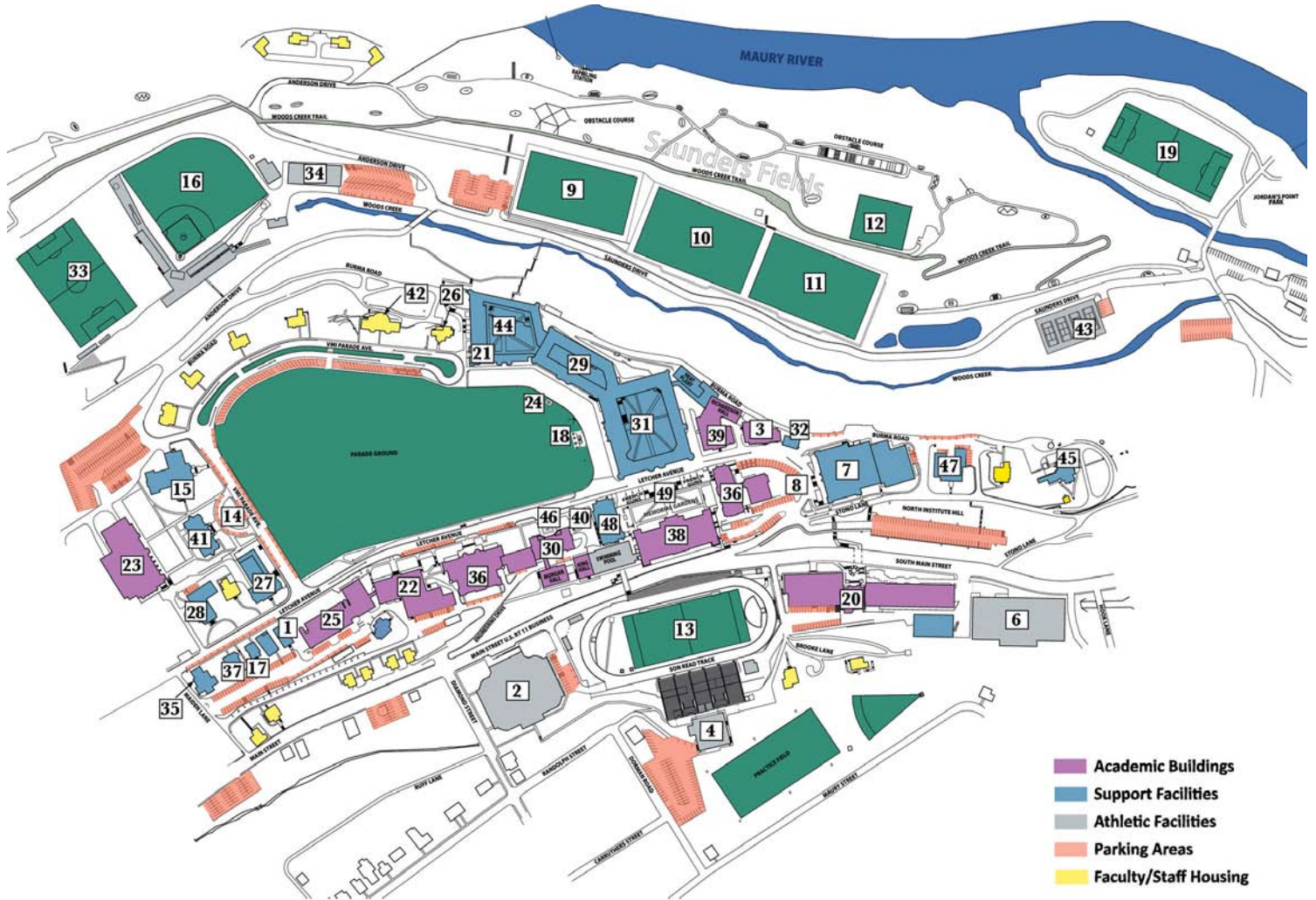
Foreign Cadets					
Legal Residence	2011	2012	2013	2014	Total
Cameroon	0	0	1	0	1
Canada	1	0	0	1	2
China	0	1	1	0	2
England (UK)	0	0	1	0	1
Kenya	1	1	0	0	2
Korea	0	1	0	0	1
Russia	0	0	0	1	1
Switzerland	0	0	0	1	1
Taiwan	4	5	4	5	18
Thailand	1	1	1	0	3
Yugoslavia	0	1	0	0	1
TOTAL	7	10	8	8	33

All Cadets					
Legal Residence	2011	2012	2013	2014	Total
TOTAL:	378	324	397	470	1569

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VIRGINIA MILITARY INSTITUTE



- | | | |
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| 1.....Admissions Office | 18.....Jackson Statue and Cadet Battery | 35.....Post Police/Bachelor Officer's Quarters |
| 2.....Cameron Hall | 19.....Jordan Point Field | 36.....Preston Library |
| 3.....Carroll Hall | 20.....Kilbourne Hall | 37.....Protocol Office |
| 4.....Clarkson-McKenna Hall | 21.....Lejeune Hall/VMI Welcome Center | 38.....Scott Shipp Hall |
| 5.....Cocke Hall | 22.....Mallory Hall | 39.....Shell Hall |
| 6.....Cormack Field House | 23.....Marshall Hall/Center for Leadership & Ethics | 40.....Shepherd Bas Relief |
| 7.....Crozet Hall | 24.....Marshall Statue | 41.....Smith Hall |
| 8.....Crozet Monument | 25.....Maury-Brooke Hall | 42.....Superintendent's Quarters |
| 9.....Drill Field 1 | 26.....Maury House | 43.....Tennis Courts |
| 10.....Drill Field 2 | 27.....Moody Hall | 44.....Third Barracks |
| 11.....Drill Field 3 | 28.....Neikirk Hall/VMI Foundation, Inc. | 45.....Turman House |
| 12.....Firing Range | 29.....New Barracks | 46....."Virginia Mourning Her Dead" Statue |
| 13.....Foster Stadium/Alumni Memorial Field | 30.....Nichols Engineering Hall | 47.....VMI Health Center |
| 14.....Francis H. Smith Statue | 31.....Old Barracks | 48.....VMI Museum/Jackson Memorial Hall |
| 15.....George C. Marshall Museum/Foundation | 32.....Old VMI Hospital | 49.....Washington Statue |
| 16.....Gray-Minor Stadium | 33.....Patchin Field | |
| 17.....Human Resources | 34.....Paulette Hall | |



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