

2005 – 2006 CATALOGUE



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INSTITUTE CALENDAR 2005-2006

CRITICAL DATES AND ACADEMIC CALENDAR

FIRST SEMESTER – 2005

New cadets matriculate (Cameron Hall)	Sat 20 Aug
Old Corps returns	Sun 28 Aug
Registration	Mon 29 Aug
Classes begin	Tue 30 Aug
Last day for course or curriculum change	Tue 6 Sep
1st Fall Reunion Weekend	Fri-Sat, 23-24 Sep
Fall FTX	Fri-Sun, 30 Sep-2 Oct
Parents Weekend	Fri-Sun, 7-9 Oct
2nd Fall Reunion Weekend	Fri-Sat, 21-22 Oct
Founders Day (no classes)	Fri, 11 Nov
Ring Figure weekend	Fri-Sun, 18-20 Nov
Thanksgiving furlough	Tue-Mon, 22-28 Nov
Classes end	Mon 12 Dec
Reading day	Tue 13 Dec
Exams	Wed-Tue, 14-20 Dec
December graduation	Tue 20 Dec
Christmas furlough	Tue-Mon, 20 Dec - 9 Jan

SECOND SEMESTER – 2006

Registration	Tue, 10 Jan
Classes begin	Wed, 11 Jan
Last day for curriculum and course changes	Wed, 18 Jan
Spring furlough	Fri-Sun, 10-19 Mar
Spring FTX (No classes Mon & Tue)	Fri-Tue, 31 Mar-4 Apr
Easter Break	Fri-Mon, 14-17 Apr
Spring Reunion Weekend	Fri-Sat, 28-29 Apr
Classes end	Fri, 28 Apr
Reading day	Mon, 1 May
Exams	Tue-Mon, 2-8 May
End First Class exams	Fri, 5 May
New Market Day ceremony	Mon, 15 May
Commencement	Tue, 16 May

Class Changes:

First Semester: Friday classes meet on Tuesday, 6 December

Second Semester: Monday classes meet on Friday, 28 April

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

THE INSTITUTE

AN EDUCATION FOR LEADERSHIP IN THE 21ST CENTURY

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

Established in 1839, VMI has shaped leaders, heroes and individuals whose daily lives reflect the integrity, fairness, and appreciation for the value of work that are instilled here. The sense of mission at VMI is at the foundation of the Institute's traditions, 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 generation of VMI graduates.

Among the alumni of VMI: a Nobel Prize winner, ten Rhodes Scholars, seven Medal of Honor recipients, a Pulitzer Prize winner, a Supreme Court Justice, 39 college presidents and 266 generals and flag officers. VMI Superintendent General J.H. Binford Peay III '62, attained the rank of four-star general. He served his country a vice chief of staff for the 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 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.

The essential and mutual purpose of the Institute's combined educational programs (academic studies, barracks life, the military system, and athletics) is to cultivate and develop in each cadet the following seven educational factors:

1. Mastery of a major field of study and commitment to life-long learning.
2. Ability to think critically and creatively
3. Ability to communicate effectively
4. Skill in interpersonal relations
5. Ability to succeed in an organizational setting
6. Commitment to ethical inquiry and standards of integrity
7. Commitment to life-long physical health and vigor.

VMI believes these seven factors represent the requisite characteristics of leaders for the 21st century.

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.

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 265 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, in which over 500 alumni served. Two VMI alumni were also among the over 3000 murdered on September 11, 2001 in the terrorist attacks on America.

Since that time, well over 400 VMI alumni, as well as about 25 serving cadets, have been called to active duty or

otherwise answered the country's call to serve in Afghanistan, Iraq, or elsewhere in support of the War on Terror. Two more VMI alumni gave the last full measure of devotion in the Fall of 2003 in Operation Iraqi Freedom.

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. In addition, all applicants must meet the standards described below.

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 uses the Department of Defense (DoDMERB) Standards (DoD Directive 6130.3 & DoD Instruction 6130.4 as a basic admission standard. (For ROTC requirements, see page 37.)

A prospective cadet who is denied admission on medical grounds may request a waiver by writing the Director of Admissions. The Post Physician will review the appeal, seek assistance from other medical specialists when appropriate, and make a recommendation to the Superintendent. The Superintendent's decision will be final. The granting of a medical waiver does not guarantee that a cadet will be eligible for commissioning. Only the 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 by the Individual Privileges Committee on an individual basis.

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 or 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

New cadets, whether first-time freshmen or transfers, are enrolled only at the beginning of each new session in August. Application for early decision may be made from **September 1** until **November 15**, and application for regular decision may be made from **September 1** until **February 15**. All applicants, including transfers, must submit the following items (additional items required for transfers will be explained when receipt of the application is acknowledged):

1. The completed application form with a check of \$35 **payable to VMI**, this being a non-refundable fee.
2. An official transcript of the high school record, to be mailed with the application form.
3. Standardized test scores must be reported directly from the testing agency if not included on the high school transcript.

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 submission 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 (2-D, 3-D, and Drawing)	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 115	3
Calculus BC	MA 115-116	6
Economics-Micro	EC 201	3
Economics-Macro	EC 202	3
English Literature/Comp.	EN 101-102	6
English Language/Comp.	EN 101-102	6
French-Language	*FR 101-102	6
French-Literature	**	TBD
German-Language	*GR 101-102	6
Government and Politics-US	PO 314	3
Government and Politics-Comp.	PO 327	3
History-US	HI 205-206	6
History-European	HI 104*****	3
History-World	HI 103-104	6
Music Theory	FA 342	1
Physics B (Liberal Arts Major)	PY 201-202	8
Physics C (All Curricula)	PY 207-208	8
Psychology	PS 201	3
Spanish-Language	*SP 101-102	6
Spanish-Literature	**	TBD
Statistics	MA 106	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.

For more information, contact VMI's Transfer Coordinator.

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

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)	EN 101	3
English B (HL/SL)	EN 101	3
Pilot-English B (HL/SL)	EN 101	3
French A1 (HL/SL)	FR 101-102	6*
French B (HL/SL)	FR 101-102	6*
Geography (HL)	Elective credit	3**
German A1 (HL/SL)	GR 101-102	6*
German B (HL/SL)	GR 101-102	6*
History (HL)	HI 104	3****
History (SL)	N/A	3*****
Mandarin	TBD	TBD***
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 115-116	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*

* 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 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, Attendance at Another College or VMI Summer Session. Subject to approval by appropriate curricular head, VMI will accept credits earned in another accredited college or in VMI Summer Session 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. At least two years (four semesters) of residence at VMI are required regardless of the number of course credits approved for transfer.

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" (3.0 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 such 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 attending a four-week Leadership Training Camp at Ft. Knox, KY. For additional information on each service's requirements, contact the individual ROTC offices. Transfers may also arrange to take first and second-year Basic ROTC courses simultaneously at VMI if they lack credit for the first year.

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 Professional 2003 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 general education experience, cadets are therefore required to demonstrate basic competency in five technological applications: word processing, email spreadsheets, use of the Internet, and presentation software. VMI provides training in these areas by means of an online training and assessment product. Individual de-

partments 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, Explorer, 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. Microcomputer 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. For example, the Preston Library is wireless capable throughout the entire building.

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 bring a laptop (notebook) computer only due to their portability, space efficiency, and low power consumption. Cadets who purchase the recommended laptop units will receive support enabling them to use their laptops on the VMI network. 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. Trained cadet technicians are also available Sunday – Thursday evenings to answer questions and perform routine troubleshooting tasks. 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 register, or failure of eligibility must apply to be readmitted. Former cadets eligible to apply for readmission should write to the Registrar requesting the current standards, information and forms. Readmission Deadlines: Fall Semester: June 1. Spring Semester: November 1. All paperwork must be submitted by the designated deadline, and all deadlines are strictly enforced. For a complete outline of the readmission standards, deadlines, and forms, see VMI's website at <http://www.vmi.edu/registrar>. Cadets dismissed for disciplinary reasons may petition for readmission upon being absent from VMI for a 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 2005-2006 SESSION

	Virginia Cadets	Non-Virginia Cadets
Tuition	4,382	18,582
Room and Board	5,666	5,666
Auxiliary Fee	<u>2,606</u>	<u>2,606</u>
Total tuition and fees	\$12,654	\$26,854
Quartermaster charge	<u>1,678</u>	<u>1,678</u>
Sub-Total	\$14,332	\$28,532
Security deposit	200	200
TOTAL DUE	\$14,532	\$28,732

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 in their fourth class and third class year will receive an ROTC uniform allowance from the Federal Government to help defray the cost of cadet uniforms. The annual allowance for the basic course is approximately \$880.

Cadets who contract with an ROTC unit during their second and first class years will also receive an

ROTC uniform allowance of approximately \$1320 per year.

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	7,066	14,166
Due December 15	7,166	14,266

Approximately five weeks prior to the due date VMI will mail an invoice directly to all registered cadets at their address of record.

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 will 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.

OTHER COSTS

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

The cadet newspaper, yearbook, literary magazine and scheduled hops 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.

Full refunds, **less \$800** are made for withdrawals prior to the first day of classes.

On or after the first day of classes, refunds are prorated through the fifth week.

No refunds are made after the fifth week of classes.

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. 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>, call 540-464-7213, or write to:

Registrar
Virginia Military Institute
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 \$4,400 over four years.
- * Tax-free subsistence allowance of \$250 per month when contracted in 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 9-14.) 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) or other approved needs analysis form. The FAFSA is available at high school counseling offices, the VMI Financial Aid Office, or 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 sent to parents in July and December will reflect credit for aid awarded. In the event of withdrawal before the end of the refund period, financial aid credits will be prorated.

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 37.

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):
Submission of this form is mandatory, and it may be obtained from your high school or from VMI. The FAFSA may be completed over the internet at <<http://www.fafsa.ed.gov>> instead of using the paper form. All applicants should indicate on the form that VMI may have access to the needs analysis information. VMI's Title IV code is 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.

WAR ORPHAN EDUCATION ACT

A state program for bonafide Virginia residents whose parents were killed or disabled due to war service or who are 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. The program includes the children of fire-fighters, police officers, and emergency workers who are killed in the line of duty.

For more information telephone the VMI Financial Aid Office at 540-464-7208 or fax 540-464-7629.

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. 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 mechanical engineering curricula are accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET).

ACADEMIC PROGRAM MISSION AND VISION

The VMI Academic Program offers cadets a rigorous curriculum with the purpose of producing educated and internationally engaged citizens of character.

Its **components** are a broad four-year core curriculum and nationally recognized majors in engineering, science, and the humanities.

It recruits, develops, and graduates **cadets** of exceptional talent, intellectual curiosity, and character, who possess a commitment to service and respect for others.

Its **faculty** is renowned for its teaching excellence, mentorship of students, encouragement of undergraduate research, and scholarly engagement.

Its **environment** includes state-of-the-art facilities, equipment, technologies, and instructional materials, first-class programs

CORE CURRICULUM

The purpose of the Core Curriculum is to develop foundational knowledge and skills that are essential to VMI's academic and military missions. Each major curriculum requires the following core courses:

Course	Number of Semesters	Semester Hours Credit
Chemistry	2	8
English 101* & 102 ¹	2	6
History 103 & 104	2	6
Mathematics	2	6
Public Speaking	1	1
Physical Education	8	4
Reserve Officers Training Corps (ROTC)	8	12
Writing-Intensive Courses ²	2	variable

¹Must be passed with a grade of "C" or better.

²At 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 chemistry, civil engineering, computer science, electrical 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, mathematics, or psychology. Detailed description of majors begins on page 41.

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 Arabic, astronomy, business, chemistry, computer engineering, computer science, English, environmental leadership and management, fine arts, French, German, history, international studies, Japanese, leadership studies, mathematics, microelectronics engineering, philosophy, physics, psychology, and Spanish. An interdisciplinary minor in Science and Security is also available. An interdisciplinary minor in writing is also available. An interdisciplinary concentration in Molecular, Cellular, and Biological Chemistry is offered. Details are available under "Curricula" in this catalog.

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/Show.asp?durki=27>.

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 any 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.

Undergraduate Research Initiative. The VMI Undergraduate Research Initiative (URI) was established to more fully integrate student scholarly inquiry into the VMI 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 advisors outside the traditional classroom environment. To expand the number and quality of those interactions at VMI, the Undergraduate Research Initiative 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; publication of the *VMI Undergraduate Research Review*; 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, Science Building, Science Library, 302A.

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 general education sequence in first-year composition (EN 101 and 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 professional 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 and 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 exchange programs for both faculty and cadets. Pro-

grams offered to cadets fall into a number of categories: international military academy exchange programs, semester/academic year abroad programs, summer abroad programs, international internships, and cultural exchanges and study tours. For more information, please contact the Director of International Programs, Old Hospital.

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, 203B Science Hall.

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. Beginning at matriculation and continuing across the four years of cadetship, faculty and staff work closely with cadets to ensure their academic and personal success. Special attention is given to new cadets to enable their successful assimilation into Institute life, with an emphasis on the balancing the requirements of the regimental system with the demands of their coursework. VMI also sponsors an Athletic Advising Program to help scholar-athletes keep their focus on academics. For information about advising, contact the Assistant Dean for Assessment and Academic Support, 102 Smith Hall.

Cadet Development and Counseling. In the Col. Mike E. "Doc" Monsour 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. The center is located in 408 Lejeune Hall.

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, VMIT provides the VMI faculty and staff with Help Desk support, hardware / software recommendations and installations, troubleshooting, and training classes. VMIT is responsible for the VMI Local Area Network, and can provide access upon request. VMIT is located in 427 Nichols Engineering Building.

Preston Library. Named for Colonel J. T. L. Preston, the library was dedicated in 1939, enlarged in 1972, and renovated in 1996. The collections currently number more than 280,000 volumes of print materials and microforms. Preston Library subscribes to over 650

scientific, literary, and general print journals and has access to thousands of full-text and citation databases, reference resources, and electronic journals. Preston Library participates in VIVA (Virtual Library of Virginia) through which it receives many of these online resources. In addition to public workstations connected to the Internet and through which patrons can access our online catalog and electronic databases. Preston Library has 110 study carrels which allow access to the local area network and the Internet. The library also has six group study rooms which are wired to allow small groups of cadets and faculty to work together. Additionally, the Library is wireless throughout. As a selective depository library, Preston Library has a collection of more than 185,000 U.S. Government and Virginia State Documents. The library installed an integrated library system in 1991 and upgraded its system in 2004. The online catalog is available at <http://library.vmi.edu>. Preston Library maintains a web presence at <http://www.vmi.edu/library/>. Interlibrary loan service is available to cadets and faculty free of charge. Preston Library includes a Media Services department which supports the media needs for faculty and cadets. It has fully-equipped multimedia room which faculty and cadets can use to develop media presentations. The Archives, a department also within the library, contains VMI's historic official records, photographs, manuscripts, and rare materials. The Archives maintains a web presence at <http://www.vmi.edu/archives>.

Miller Academic Center. The Miller Academic Center helps cadets at all levels develop skills and strategies that will enable them to become independent, active learners and to achieve academic success. Programs and services reflect a holistic approach that emphasizes the development and interdependence of self-management, learning, and motivational skills in the context of the VMI culture. Topics include concentration, time/stress management, goal setting, memorization, note-taking, textbook reading, test preparation and test-taking. Assistance is provided through individual conferences, group workshops and class presentations. Additionally, the center provides training and oversight for the certified Cadet Academic Mentor, tutoring and study group programs, and works closely with faculty to identify and meet learning needs. The center is located in 215 Carroll Hall.

Services for Students With Disabilities

VMI is committed to providing all cadets with an equal opportunity to achieve academic success. As part of this commitment, the Miller Academic Center in Carroll Hall offers an integrated set of services to assist students with disabilities. At the Center, students meet

to design individualized support programs. In addition, the director assists students in securing approved classroom accommodations when they are appropriate. The Center sponsors, as well, a cadet-led mentoring program for students with disabilities. Cadets with disabilities who plan to take advantage of the support services should contact Lt. Col. Lenna Ojure, Director of Disabilities Services, by phone at 540-464-7765 or by email at ojure@vmi.edu.

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 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 202 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/show.asp?durki=252>. 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 Associate 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/show.asp?durki=812>.

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.

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 Planning and Administration; the Associate Dean for Academic Affairs; the Assistant Dean for Assessment and Advising; 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/show.asp?durki=243>.



THE CO-CURRICULAR PROGRAM

The distinctive VMI approach to higher education, which is the result of over 160 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 mess hall. 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 40 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 optional.

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. 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. Although in ROTC classes and field maneuvers cadets are organized for Army, Navy, Marine, and Air Force training, 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, or five 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 Classmen may keep civilian clothes in their rooms. Fourth Classmen may not keep electrical equipment, such as razors, radios and

stereo 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.

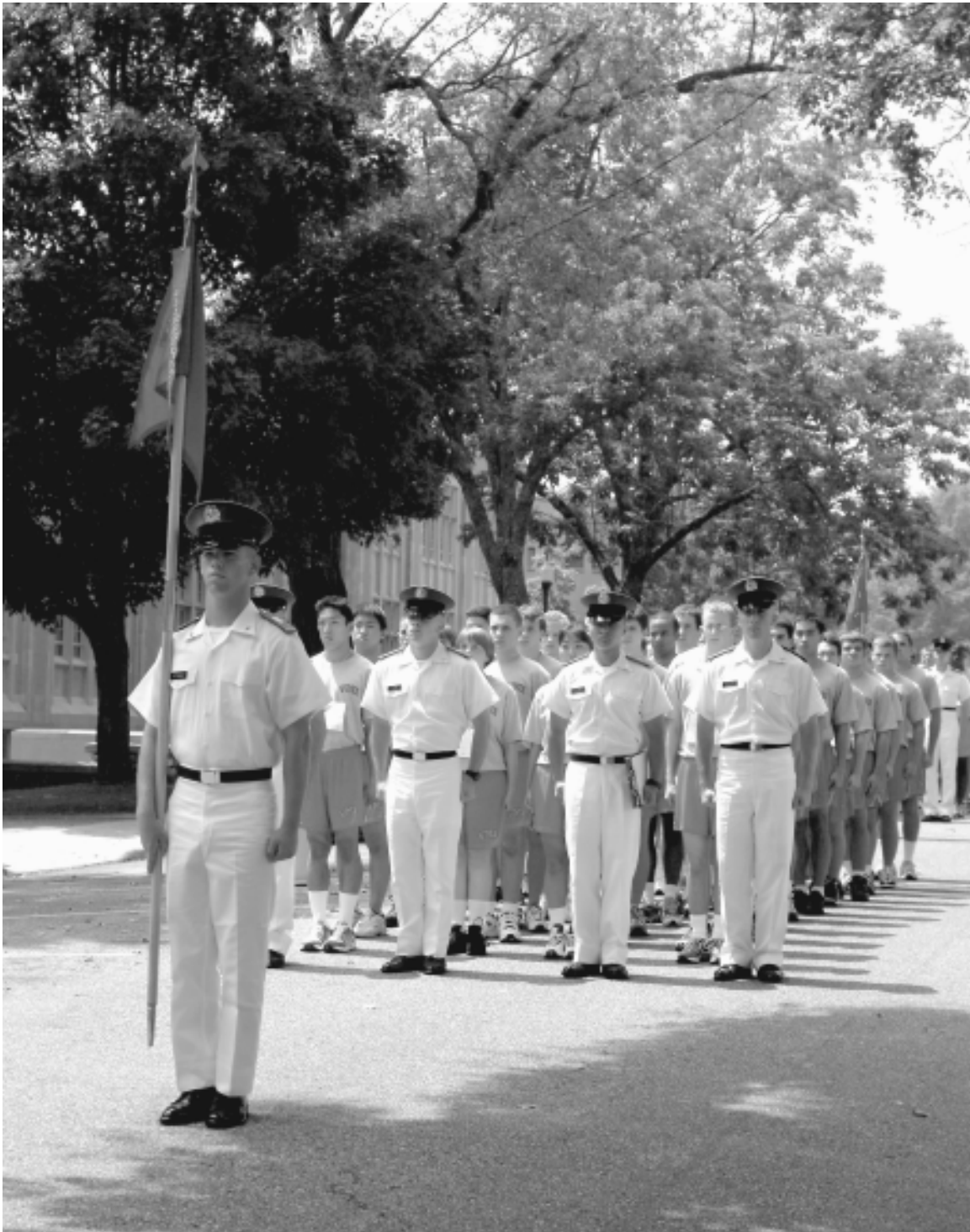
ABSENCES FROM DUTY

Although ample provision is 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, Christmas, 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 increasing as the cadet advances toward the First Class. Athletic teams make trips to participate in games, and publications staffs and clubs are granted absences to carry on their affairs. Cadets who make the Dean's Honor List are eligible for special furloughs, and First Classmen 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. All sports compete at the NCAA Division I level. Teams are fielded in baseball, basketball, men's and women's cross-country, football, lacrosse, 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 and wrestling. Every cadet is welcomed as a candidate for participation in any sport in which he/she may be interested. All freshman athletes must be certified through the NCAA Initial-Eligibility Clearinghouse and all upperclassmen athletes must be certified by the VMI Registrar's Office by satisfying NCAA Bylaws 14.3 and 14.4 respectively, prior to competition.

Intramural athletics provide an important part of the program, and all cadets participate in a wide range of contests among the companies of the cadet regiment. Included in the program are aerobics, flag football, boxing, basketball, handball, and racquetball. Winning scores count, but so does extent of cadet participation, in the award of points toward class and individual championships.

Club sports compete with various colleges and fall under the guidance 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

Sounding Brass, literary magazine established in 1966

Religious Services

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.

Numerous opportunities are provided to encourage the development of personal faith. The Institute Chaplain conducts non-denominational services each Sunday morning while VMI is in session. A campus fellowship meeting is available each Sunday evening for those of Christian faith and those who are curious. Bible study groups are conducted by the Newman Club, Baptist Student Union, Canterbury Club, Officers Christian Fellowship, Fellowship of Christian Athletes and others.

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
 Delta Phi Alpha, an honor society in German
 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
 Sigma Beta Delta, 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

There are more than 50 cadet clubs, club sports, and organizations at VMI. 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 125 cadets within the Corps, 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 its own room in the library to foster interest in serious music within the Corps. Also available at little or no cost are concerts by guest artists sponsored by the Washington and Lee Concert Guild. The society also sponsors concerts at VMI for the entire Corps. Trips are made for musical events in nearby cities, and each spring approximately 20 cadets participate in a trip to New York to attend the Metropolitan Opera and the New York Philharmonic.

Social Events

The Regimental S7 is responsible for the corps social events. There are many social events during the year that include Parents Weekend, Ring Figure Weekend, the midwinter formal.

Cadet Activities Building

Lejeune Hall, the Cadet Activities Building, is adjacent to barracks and provides facilities for social and recreational activities for cadets, their guests, and their parents. Lejeune Hall also houses the Keydet Kanteen, the bookstore, and the visitor information and assistance desk.

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.

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 Company Cup for Academic Achievement. Established in 1970 and awarded to the cadet company with the highest cumulative grade point average.

The Major General Richard C. Coupland '15 Electrical Engineering Award. Established in 1991, and awarded to a second classman, majoring in electrical engineering, who has 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 Marshall Prize for Military History. Established by the Thirteenth Superintendent, Major General and Mrs. Josiah Bunting III in honor of VMI Alumnus General George C. Marshall. The prize is awarded annually to a fourth classman who has prepared a paper on a military history topic. The winner will be selected by a committee chaired by the editor of the *Journal of Military History*.

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 graduate in the mechanical engineering curriculum.

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

John Robert Philpott Medal. Established in honor of Mr. Philpott, Class of 1935, to acknowledge his efforts as National Chairman of the Economics Fund Drive which resulted in establishment of the Mary Moody Northen Distinguished Scholars Chair in the Arts and Social Sciences. To be awarded to an economics and business major in the graduating class who excels in the study of business subjects.

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 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 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 excellence in economic studies by an economics and business major in the graduating class. The initial award was made at Finals 1971.

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, intramural athletics, 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 Commandant's Cup. A trophy cup awarded to the company winning the Commandant's Cup competition consisting of four

athletic-military events. Established by Colonel Glover S. Johns, Commandant of Cadets, 1957-60.

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 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 1949-A who was 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 Henry Fairfax Ayres Football Medal. Established in 1972 by the VMI Foundation in honor of Colonel Henry Fairfax Ayres, Class of 1906 (USMA '08), in recognition of his support of the faculty assistance program and in recognition of his athletic prowess. The medal is awarded to the most valuable football player in the first class as nominated by the coaches and Director of Athletics, and approved by the Superintendent.

The Henry Johnson Award. Henry Johnson served as equipment manager at VMI for thirty-four years. His closest contacts to cadets were those who participated in sports and, particularly, the individual team managers. It is appropriate for this memorial award to honor a team manager for there is no other recognition for these young men who work very hard behind the scenes. Initial funding for the award is being provided by Mr. John Blake '79.

The Intercollegiate Sports Award. To the outstanding athlete in either football, basketball, baseball, or track, and one for the outstanding athlete in all other sports.

The Hardin Massie Track Award. Established by the family of Hardin Massie, Class of 1916, and presented annually to the track and field athlete best exemplifying the spirit of VMI.

The Carol Bozeman Award. Awarded to the female track & field athlete best exemplifying the spirit of VMI.

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.

OTHER ATHLETICS AWARDS - COACH:

VMI Distinguished Coaching Award. Established by N.W. Pendleton, Jr. '57 in memory of his father, N.W. Pendleton '22 to recognize and encourage excellence in coaching at the Virginia Military Institute.

VMI Coaching Enhancement Program. Established by N.W. Pendleton, Jr. '57 as a memorial to his father, N.W. Pendleton '22 to encourage and recognize excellence in coaching at the Virginia Military Institute.

OTHER PRIZES

Other prizes and awards are presented from time to time to recognize special accomplishments in studies, military activities, marksmanship, and athletics. Announcements are carried in the official records of the Institute.

MEDICAL SERVICES

An annual fee, included among the fixed fees listed elsewhere in this catalogue, provides for normal medical care, and a full-time physician is available to attend the needs of cadets who may be ill. Located on post is a modern infirmary, with a nurse on 24-hour duty, which allows for hospitalization, isolation and treatment of simple diseases and minor injuries. In case of serious illness, serious injury, or when surgery is required, the physician makes arrangements for the necessary treatment, since medical conditions which for any reason cannot be treated at the infirmary and that require treatment elsewhere, must be treated at the cadet's expense.

The Institute does not assume responsibility for the expense of caring for injuries (other than minor injuries) sustained by students while training for or participating in intramural or club athletic events, the military program, clubs, or similar activities.

VMI strongly recommends that cadets not otherwise covered enroll in a low-cost accident and health insurance program that is offered by an insurance company independent of the Institute. VMI encourages parents and/or cadets to carry this insurance or a substitute health plan that is comparable. Complete information is provided by the insurance company after the applicant is accepted for enrollment. **All correspondence having to do with this insurance should be directly with the insurance agent and not with 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, ungentlemanly 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 suspended or 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 programs include information on specific programs and 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 Direct Student Loan Clearinghouse, non-faculty advisor, 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/show.asp?durki=817>).

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 Marketing and Communications (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 Marketing and Communications in writing within 7 days of the start of the fall semester if he/she does not want directory information released.

RECORD UPDATES

Cadets are responsible for keeping their personal records updated while enrolled. Home address changes and changes for emergency contacts should be reported promptly and in person 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 enroll (contract with) in an ROTC unit during their second and first class years. 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.

At the beginning of the junior year, qualified cadets are encouraged to contract with Army ROTC as 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 com-

plete 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 Combat Diver Qualification Course. 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 with 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. NROTC courses for the first year are the same for all cadets regardless of whether they are pursuing a Navy or Marine Commission.

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 night land navigation training at Marine Corps Base, Quantico, Virginia to operating Navy vessels at the U.S. Naval Academy in Annapolis, Maryland or at Smith Mountain Lake, VA.

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. 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 divided into 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. If selected to enter the POC, cadets sign a contract for commissioned service following graduation. 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 all tuition, books, and fees.

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

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 up to \$20,000 per year for tuition and fees, \$900 per semester for books, and a monthly stipend of up to \$250-\$400 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, \$300 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 automatically be considered for advanced standing. If selected, Midshipmen receive a monthly subsistence allowance of \$350 throughout the school year. 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.

Freshmen and sophomore cadets with a GPA of 2.5 or above, who are enrolled in the Air Force program and who meet other qualifying factors, may receive a 2 or 3 year scholarship up to \$15,000 for tuition and fees. In addition to tuition and fees, scholarship cadets receive a monthly stipend according to their respective school year (e.g. freshman: \$250, sophomore: \$300; junior: \$350; senior: \$400), annual military uniform stipends in the amount ranging from \$880 to \$1,300 and \$600 annually for books.

Incoming freshman with a 3 or 4 year AFROTC scholarship, who maintain satisfactory disciplinary standing with the Corps of Cadets and who maintain a 2.5 cumulative GPA in the 1st year/2.0 or higher cumulative GPA each subsequent year, will receive a \$1,000 annual stipend from VMI to help defray the cost 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 second year at VMI.

BENEFITS

Qualified ROTC cadets will receive the following benefits:

- * Uniform allowance up to approximately \$3,000 over four years.
- * Tax-free monthly stipend is \$250 for freshman and sophomore year ROTC scholarship cadets. During junior and senior years, this allowance ranges from \$300 to \$400 per month for scholarship and other contracted cadets.
- * Naval ROTC cadets receive a monthly stipend of \$250 for freshman, \$300 for sophomore, \$350 for junior, \$400 for senior.
- * 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 the Combat Diver Qualification Course. 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, combined arms exercise, or mountain warfare. During the third summer, candidates for Navy commissions perform their training with fleet operational ships or aviation squadrons, serving as 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 third and second class years. This training, conducted at active duty U.S. Air Force installations across the country, is designed to develop military leadership and discipline as well as provide an orientation to actual Air Force operations. At the same time, each cadet is evaluated for potential as an Air Force officer. Field Training may include a jet orientation flight as well as marksmanship, survival, and physical fitness training. A variety of professional development training programs are available to qualified GMC cadets during the summer between their fourth and third class years and to interested POC cadets between their second and first class years. Cadets may volunteer for parachute or glider training at the U.S. Air Force Academy or 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.

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

The Fourth Class academic program follows:

1. English: All cadets take two courses of English Composition. Each must be passed with a C or better.
2. Mathematics: Most cadets take two courses while some science and engineering majors take three courses.
3. Science: All cadets take two courses in chemistry.
4. History: Most cadets take two semesters of World History.
5. Aerospace Studies, Military Science, or Naval Science: All cadets take two semesters of their choice.
6. Physical Education: All cadets take two semesters.
7. Liberal Arts majors take two semesters of a foreign language. Other majors may take an additional course as noted on the curricular synopses which follow.

Detailed requirements for each curriculum are listed on the following pages. All curricula as summarized in the following tables are subject to change.

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.

BIOLOGY CURRICULA

The mission of the biology department at VMI is to provide students with a focused education in the biological sciences. The degree programs prepare majors to pursue post-graduate education in the biological and health sciences and allow for specialization that matches the cadet's 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. In 1991, the biology department developed 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 several publications have resulted from these projects. Normally, cadets are selected to participate in this program between their second and first class years.

B.S. Curriculum

All students in the B.S. curriculum are required to complete the following courses:

- BI 101 General Biology I
- BI 102 General Biology II
- BI 201 Biostatistics
- BI 205 Genetics
- BI 420 Biology Seminar

In addition to these courses, a B.S. major must select one laboratory course (*) from each of the following core areas.

The Anatomy Core Area includes:

- BI 303 Developmental Biology*
- BI 304 Comparative Vertebrate Morphology*
- BI 405 Histology*

The Cell and Molecular Core Area includes:

- BI 302 Cell Biology*
- BI 413 Microbiology*
- BI 411 Immunology

The Organismal Biology Core Area includes:

- BI 204 Physiology*
- BI 216 Animal Behavior
- BI 312 Ecology*
- BI 321 Invertebrate Zoology*
- BI 324 Ornithology*
- BI 410 Evolution

The Plant Biology Core Area includes:

- BI 217 Botany*
- BI 318 Plant Morphology*

An additional 10 hours are to be selected from any area within the biology curriculum except for research hours. This totals 43 hours in biology. In addition to the biology courses, B.S. majors must complete two semesters of Organic Chemistry with lab (CH 223 and 225, CH 224 and 226), CH 322 Biochemistry, MA 115 and 116 Calculus I and II, and General Physics I and II (PY 201 and PY 211, PY 202 and PY 212). 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, history, economics, business, psychology, philosophy, fine arts, political science, or modern languages. The remainder (11) 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

The B.A. Curriculum is designed for those majors who require greater flexibility in their degree requirements and desire a broad training in biology. All students in the B.A. curriculum are required to complete the following courses:

- BI 101 General Biology I
- BI 102 General Biology II
- BI 201 Biostatistics
- BI 205 Genetics
- BI 312 Ecology
- BI 420 Biology Seminar

In addition to these courses a B.A. major must select one laboratory course (*) from three of the following four core areas.

The Anatomy Core Area includes:

BI 303 Developmental Biology*
BI 304 Comparative Vertebrate Morphology*
BI 405 Histology*

The Cell and Molecular Core Area includes:

BI 302 Cell Biology*
BI 413 Microbiology*
BI 411 Immunology

The Organismal Biology Core Area includes:

BI 204 Physiology*
BI 216 Animal Behavior
BI 321 Invertebrate Zoology*
BI 324 Ornithology*
BI 410 Evolution

The Plant Biology Core Area includes:

BI 217 Botany*
BI 318 Plant Morphology*

An additional 10 hours are to be selected from any area within the biology curriculum except for research hours. This totals 43 hours in biology. In addition to the biology courses, B.A. majors must complete MA 115 and 116 (Calculus I and II) 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 201 and PY 211, PY 202 and PY 212). To broaden the education, six credits of English above the 100 level are required. Additionally, 14 non-science elective credits must be completed in either English, history, economics, business, psychology, philosophy, fine arts, political science, or modern languages. The remainder (9) of the

135-136 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.

An Honors Program, open to majors who have demonstrated excellence in the study of biology offers opportunities to engage in more extensive research under the close supervision of a faculty sponsor.

Concentration in Molecular, Cellular, and Biological Chemistry

The Concentration in Molecular, Cellular, and Biological Chemistry (CMCBC) is designed for the biology, chemistry, or other science or engineering majors who wish to emphasize molecular, biochemical, and/or biotechnology issues in their studies. It is also designed to offer students undergraduate research opportunities in these areas of concentration. This option does not change the credit hours needed for the BS/BA in biology or the BS/BA chemistry degrees. However, it specifies that 14 credit hours of the following CMCBC courses be taken as part of the student's major or elective options: BC 321 (CH 321) Structural Biochemistry, 3 credits; BC 322 (CH 322) Metabolic Biochemistry, 3 credits; BC 311 (CH 311) Biochemistry Lab, 1 credit; BC 400 CMCBC Seminar, 1 credit; BC 410 CMCBC Special Topics, 3 credits; and BC 430 Molecular Biology, 3 credits. In addition, students will undertake two semesters of summer or academic year research in a CMCBC approved project. Biology majors will also be required to take BI 302 Cell Biology, 4 credits, from their cell and molecular core area.

SYNOPSIS OF THE B.S. CURRICULUM IN BIOLOGY

First Semester		Second Semester	
Subject	Semester Hrs Credit	Subject	Semester Hrs. Credit
FOURTH (Freshman) CLASS			
BI 101	General Biology I 4	BI 102	General Biology II 4
CH 117	Lab for CH 137 1	CH 118	Lab for CH 138 1
CH 137	Intro Chem I 3	CH 138	Introductory Chemistry II 3
EN 101	English Composition I* 3	EN 102	English Composition II* 3
HI 103	World History 3	HI 104	World History 3
PE 101	Swimming 1/2	PE 102	Boxing 1/2
	AS, MS, or NS 1		AS, MS, or NS 1
	<u>15 1/2</u>		<u>15 1/2</u>
THIRD (Sophomore) CLASS			
BI 205	Genetics or Area Elective 4	BI	Area Elective 4
CH 223	Organic Chemistry I 3	CH 224	Organic Chemistry II 3
CH 225	Organic Lab I 1 1/2	CH 226	Organic Lab II 1 1/2
EN	Elective 3	EN	Elective 3
MA 115	Calc. with An Geometry I* 3	MA 116	Calc. with An. Geom. II 3
PE 211	Drug & Alcohol Awareness 1/2	SE 300	Public Speaking 1
	AS, MS, or NS 1	PE 200	Drug/Alcohol 1/2
	<u>16</u>		<u>17-18</u>
SECOND (Junior) CLASS			
BI	Genetics or Area Elective 4	BI	Elective 3
BI 201	Biostatistics 3	CH 322	Biochemistry 3
PY 201	General Physics I 3	PY 202	General Physics II 3
PY 211	General Physics I Lab 1	PY 212	General Physics II Lab 1
	LA Elective 3		LA Elective 3
PE 300	Prin. Physical Conditioning 1/2		Elective 3
	AS, MS, or NS 2/1 NS	PE	Physical Education 1/2
	<u>15 1/2 -16 1/2</u>		<u>2</u>
			<u>18 1/2</u>
FIRST (Senior) CLASS			
BI 420	Biology Seminar 3	BI	Area Elective 4
BI	Area Elective 4	BI	Biology Elective 4
BI	Elective 3		LA Elective 3
	LA Elective 3		Elective 4
	Electives 3		Physical Education 1/2
	Physical Education 1/2		AS, MS, or NS 2
	AS, MS, or NS 2		<u>17 1/2</u>
	<u>18 1/2</u>		
* Needs Grade of C or better			
Name _____		BI (B.S.) (135 Hrs. Reg.-43.0 BI hours)	
Class _____			

SYNOPSIS OF THE B.A. CURRICULUM IN BIOLOGY

First Semester		Semester Hrs Credit	Second Semester		Semester Hrs. Credit
Subject			Subject		
FOURTH (Freshman) CLASS					
BI 101	General Biology I	4	BI 102	General Biology II	4
CH 117	Lab for CH 137	1 1/2	CH 118	Lab for CH 138	1 1/2
CH 137	Introductory Chemistry I	3	CH 138	Introductory Chemistry II	3
EN 101	English Composition I*	3	EN 102	English Composition II*	3
HI 103	World History	3	HI 104	World History	3
PE 101	Swimming	1/2	PE 102	Boxing	1/2
	AS, MS, or NS	1		AS, MS, or NS	1
		<u>15 1/2</u>			<u>15 1/2</u>
THIRD (Sophomore) CLASS					
BI 205	Genetics	4	BI	Area Elective	3
EN	Elective	3	BI	Elective	3
	Elective	3	EN	Elective	3
101	Language	3	102	Language	3
MA 115	Calc. with An. Geometry I*	3	MA 116	Calc. with An. Geom. II	3
PE 211	Wrestling	1/2	SE 300	Public Speaking	1
	AS, MS, or NS	1	PE 200	Drug & Alcohol Awareness	1/2
		<u>17 1/2</u>		AS, MS, or NS	1/2 NS
					<u>18 1/2 -19 1/2</u>
SECOND (Junior) CLASS					
BI 311	Area Elective	4	BI 312	Ecology	4
CH 223	*Organic Chemistry I AND	3	CH 224	*Organic Chemistry II AND	3
CH 225	Organic Lab, OR	1 1/2	CH 226	Organic Lab II, OR	1 1/2
PY 201	General Physics I	3	PY 202	General Physics II	3
PY 211	General Physics I Lab	1	PY 212	General Physics II Lab	1
BI 201	Biostatistics	3		LA Elective	3
201	Language	3	202	Language	3
PE 300	Prin. Physical Conditioning	1/2	PE	Physical Education	1/2
	AS, MS, or NS	2/1 NS		AS, MS, or NS	2
		<u>15 1/2 -17</u>			<u>16 1/2 -17</u>
FIRST (Senior) CLASS					
BI 420	BI Seminar	3	BI	Area Elective	4
BI	Area Elective	4		Elective	3
BI	Elective	3		LA Elective	3
	LA Elective	3		LA Elective	4
	Elective	3	PE	Elective	1/2
	Physical Education	1/2		AS, MS, or NS	2
	AS, MS, or NS	2			<u>16 1/2</u>
		<u>18 1/2</u>			
<p># Cadets who complete Organic Chemistry I & II and labs (9 credits) may reduce the science elective requirement by one hour. * Needs grade of C or better</p>					
Name _____					
Class _____			BI (B.A.) (135-136 Hours Reg.-43 BI Hours)		

CHEMISTRY CURRICULA

The mission of the chemistry department is to provide cadets who major in chemistry the educational opportunities required for a career in chemistry. Upon graduation, the degree program offers chemistry majors sufficient preparation either to pursue post graduate education in chemistry, biological chemistry or health sciences or to qualify for a variety of positions in industry or government. The Chemistry Department's B.S. degree is approved by the American Chemical Society. Cadets fulfilling these requirements are certified as having met the standards of professional training by the society.

Cadets who major in chemistry may elect to pursue a B.A. curriculum and complement this degree option with an area of concentration in business, pre-engineering or teaching. Faculty members will work closely with majors to design a program that best meets the cadets' career goals.

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. Concentrations in one of the following four areas must be accomplished:

Business Minor

EC 201 Principles of Microeconomics; EC 202 Principles of Macroeconomics; EC 203 Statistics; BU 210 Financial Accounting; BU 220 Principles of Management; EN 342 Technical Writing; two additional BU/EC courses from BU 230, BU 320, BU 310, BU 322, and BU 422 as options.

Pre-Chemical Engineering

ME 201 Statics; ME 311 Thermodynamics; ME 332 Heat & Mass Transfer; ME 312 Thermodynamics II; CE 309 Fluid Mechanics; CE 352 Systems Engineering; MA 215 Calculus III; MA 301 High Math for Engineers; MA 311 Differential Equations (Strongly Suggested); PY 207-208 must be the science elective.

Biological Chemistry or Pre-Medicine

BI 101-102 General Biology; BI 302 Cell Biology; BC/CH 321 or 322 Biochemistry*; BI 205 Genetics; BI 204 Physiology; BI 303 Developmental Biology (*also counts as one of the chemistry electives; and BI 304 Comparative Morphology can be substituted).

Teaching

BI 101 General Biology I; 6 hours of physics courses; MA 118 Finite Math; MA elective; ED 301 Foundations of Education; ED 302 Individuality in Education; ED 401 Secondary Methods; PE 330 Health Education; EN 342 Technical Writing; PS 307 Developmental Psychology; Chemistry electives must be CH 362 Teaching Mentorship and CH 396 History/Philosophy of Chemistry.

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. **A Concentration in Molecular, Cellular, and Biological Chemistry**— The Departments of Biology and Chemistry offer an interdisciplinary concentration to those cadets wishing to focus on the emerging fields of molecular biology and/or biochemistry. Requirements are listed in the description of the Biology Curricula.

SYNOPSIS OF THE B.S. CURRICULUM IN CHEMISTRY

First Semester		Second Semester	
Subject	Semester Hrs. Credit	Subject	Semester Hrs. Credit
FOURTH (Freshman) CLASS			
CH 125	Lab for CH 137 1 1/2	CH 126	Lab for CH 138 1 1/2
CH 137	Introductory Chemistry I 3	CH 138	Introductory Chemistry II 3
EN 101	English Composition I 3		Elective 3
HI 103	World History 3	EN 102	English Composition II 3
MA 115	Calc. with An. Geom. I 3	HI 104	World History 3
PE 101	Swimming 1/2	MA 116	Calc. with An. Geom. II 3
	AS, MS, or NS <u>1</u>	PE 102	Boxing 1/2
	15		AS, MS, or NS <u>1</u>
			18
THIRD (Sophomore) CLASS			
CH 223	Organic Chemistry I 3	CH 224	Organic Chemistry II 3
CH 225	Organic Lab I 1 1/2	CH 226	Organic Lab II 1 1/2
CH 246	Inorganic Chemistry 3	PY 208	General Physics II (with PY 218) 4
PY 207	General Physics I (with PY 217) 4	MA	#Math Elective 2
MA 215	Calc. with An. Geom. III 4	PE 211	Wrestling 1/2
PE 200	Drug and Alcohol Awareness 1/2		*Electives 6
	AS, MS, or NS <u>1</u>		AS, MS, or NS <u>1/2 NS</u>
	17		18-19
SECOND (Junior) CLASS			
CH 301	Physical Chemistry I 3	CH 302	Physical Chemistry II 3
CH 311	Lab for CH 301 1 1/2	CH 312	**Lab for CH 312 1 1/2
CH 315	Analytical Chemistry I 4 1/2	CH 316	Analytical Chemistry II 4 1/2
CH 321	Structural Biochemistry 3		*Elective 3
PE 300	Prin. Physical Conditioning 1/2	SE 300	Public Speaking 1
	*Elective 3		Physical Education 1/2
	AS, MS, or NS <u>2/1 NS</u>		AS, MS, or NS <u>2</u>
	16 1/2 - 17 1/2		15 1/2
FIRST (Senior) CLASS			
CH 423	**Qual. Organic Chem. 4	CH 426	**Adv. Organic Chemistry 3
CH 451	**Senior Thesis 2	CH 434	**Inorganic Syn. Lab 2
CH 461	**Selected Topics/CH 3	CH 452	**Senior Thesis 3
CH 467	**Theoretical Chemistry 3	CH 462	**Selected Topics/CH 3
	*Elective 3		*Electives 3
	Physical Education 1/2		Physical Education 1/2
	AS, MS, or NS <u>2</u>		AS, MS, or NS <u>2</u>
	17 1/2		16 1/2

Total Hours: 135 (includes at least 52.5 chemistry hours depending on options selected)

*Twelve semester hours of electives must be in the Humanistic-Social area. For those intending to pursue graduate studies in chemistry, it is highly recommended that at least two semesters of a language, preferably German be chosen.

**Optional chemistry courses. (1) student is required to take at least six semester hours of the following advanced chemistry courses: CH 423, CH 426, CH 451, CH 452, CH 444, CH 457, CH 458, CH 461, CH 462, CH 463, CH 464, CH 467. (2) student is required to take at least four of the following laboratory courses: CH 312, CH 357, CH 358, CH 359, CH 360, CH 402, CH 423, CH 434, CH 451, CH 452, CH 457, CH 458 (where CH 357, CH 358, CH 457 or CH 458 is appropriate only if taken for at least 3 semester hours credit).

#It is recommended that the mathematics elective be MA 311. However, it may be any mathematics course exclusive of MA 105, MA 106, MA 107, or MA 114.

SYNOPSIS OF THE B.A. CURRICULUM IN CHEMISTRY

First Semester		Second Semester	
Subject	Semester Hrs. Credit	Subject	Semester Hrs. Credit
FOURTH (Freshman) CLASS			
CH 125	Lab for CH 137 1 1/2	CH 126	Lab for CH 138 1 1/2
CH 137	Introductory Chemistry I 3	CH 138	Introductory Chemistry II 3
EN 101	English Composition I 3		Elective 3
HI 103	World History 3	EN 102	English Composition II 3
MA 115	Calc. with An. Geom. I 3	HI 104	World History 3
PE 101	Swimming 1/2	MA 116	Calc. with An. Geom. II 3
	AS, MS, or NS <u>1</u>	PE 102	Boxing 1/2
	15		AS, MS, or NS <u>1</u>
			18
THIRD (Sophomore) CLASS			
CH 223	Organic Chemistry I 3	CH 224	Organic Chemistry II 3
CH 225	Organic Lab I 1 1/2	CH 226	Organic Lab II 1 1/2
CH 315	Analytical Chemistry I 4 1/2	SE 300	Public Speaking 1
PE 200	Drug and Alcohol Awareness 1/2	PE 211	Wrestling 1/2
	# Concentration Elective 3		#Concentration Elective. 3
	*Language 3		*Language 3
	AS, MS, or NS <u>1</u>		*Elective 3
	16 1/2		AS, MS, or NS <u>1/2 NS</u>
			16-17
SECOND (Junior) CLASS			
CH 301	Physical Chemistry I 3	CH 246	Inorganic Chemistry 3
CH 311	Lab for CH 301 1		Science Elective 4
CH 321	Structural Biochemistry 3		*Language 3
	Science Elective 4		#Concentration Elective 3
	*Language 3		*Elective 3
PE 300	Prin. Physical Conditioning 1/2		Physical Education. 1/2
	AS, MS, or NS <u>2/1 NS</u>		AS, MS, or NS <u>2</u>
	16-17		18 1/2
FIRST (Senior) CLASS			
	**Chemistry Elective 3		**Chemistry Elective 3
	#Concentration Elective 3		#Concentration Elective 3
	*Electives 9		*Electives 8
	Physical Education 1/2		Physical Education 1/2
	AS, MS, or NS <u>2</u>		AS, MS, or NS <u>2</u>
	17 1/2		16 1/2
Total Hours: 135 (includes at least 39 chemistry hours)			
<p>*Twelve semester hours of electives must be in the Humanistic-Social area.</p> <p>#Concentration electives are defined by published requirements for concentration areas in pre-chemical engineering, business, pre-medicine, and teaching(may require use of free elective hours to take the required courses in the chosen concentration area).</p> <p>**Chemistry electives may be specified by chosen concentration areas.</p>			

CIVIL ENGINEERING CURRICULUM

Civil Engineering is the oldest of the engineering professions and the broadest in scope. It is the parent of all other branches of engineering. The Civil Engineering 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 seven Civil Engineering sub-disciplines available to cadets at VMI are:

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. Think building — from highways to 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. Think 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, conveyance of water and other fluids. Think 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. Think the "Leaning Tower of Pisa."

Hydrology & Water Resources Engineering focuses on surface and ground water quantity and supply, storm water runoff and control, canals and river channels, reservoirs, flood control, irrigation supply, water policy, and many other related activities. Think 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. Think 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. Think the US 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 52. Regardless of the specific concentration or course mix selected, graduates of the Civil and Environmental Engineering Department receive a Bachelor of Science degree in Civil Engineering.

CE CURRICULUM

The Civil Engineering curriculum includes 139 credit hours of which 47 credit hours are for Civil Engineering courses. The non-Civil Engineering courses include 15 credit hours of mathematics, 16 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 9 credit hours are required for humanities and social science electives.

The humanities and social science (HASS) electives may be generally selected from 200-level or higher courses in economics (EC), education (ED), English (EN), environmental leadership (EL), fine arts (FA), history (HI), modern languages (ML), philosophy (PH), psychology (PS), and political science (PO). Honors courses may also be accepted with approval of the CE and Science & Security Department Head. Modern language course selections may begin at the 100-level, but multiple ML 100-level courses must occur in a single language sequence. A complete list of approved HASS courses is available from the CE Department Office or on the CE web page. A few representative HASS courses include:

- EC201 Principles of Microeconomics
- EN310 Shakespeare
- FA251 History of Art
- HI354 Great Battles & Commanders in history
- PH307 Comparative Religion
- PS302 Social Psychology
- PO325 International Politics

SP101/102 Elementary Spanish

The Civil Engineering program educational objectives are to produce graduates who:

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

The Civil Engineering program outcomes will enable graduates to:

1. use fundamental principles of mathematics, science and engineering to identify, formulate and solve Civil Engineering problems
2. apply knowledge of mathematics and science to the design of Civil Engineering components and systems while working individually and/or in groups and using modern engineering tools
3. design and conduct laboratory experiments in diverse areas of Civil Engineering
4. understand the impact of civil engineering works on society
5. communicate technical information effectively
6. examine ethical principles and issues underlying professional decisions
7. recognize the need for continuing education

The Civil Engineering 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 tenured faculty have a Ph.D. 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.

Within the curriculum, certain skills and topics receive special and continued emphasis. Use of the computer as a productivity tool and a sophisticated analytical tool is stressed throughout the curriculum. Computer-Aided Drafting (CAD) and spreadsheet analysis are taught in introductory level courses and used throughout the upper level courses. Oral and written communication skills are likewise taught in lower level

courses and exercised in the upper level courses. Ethics and professionalism are introduced during the first semester and woven into many of the engineering courses.

PROFESSIONAL ACTIVITIES

Each year the department sponsors the Environment Virginia Conference in the spring. This conference is attended by state, federal, and municipal officials, engineers, and contractors. Continuing education courses are conducted each year for surveyors, engineers, and public works personnel.

The VMI Student Chapter of the American Society of Civil Engineers (ASCE) serves as the focal point of professional activities for our cadets. Eligible Civil Engineering cadets are inducted into the national engineering honor society, Tau Beta Pi, which recognizes cadets for academic excellence and leadership characteristics. All Civil Engineering majors are required to take the Fundamentals of Engineering (FE) examination during their first class year as a graduation requirement and as the first step towards becoming registered Professional Engineers.

HIGH SCHOOL PREPARATION

Applicants considering Civil 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.

ENVIRONMENTAL LEADERSHIP AND MANAGEMENT MINOR

The Civil and Environmental Engineering Department sponsors a minor in Environmental Leadership and Management (ELM), which is offered to all cadets to provide increased awareness of important environmental concerns and to prepare them for leadership roles in addressing and solving environmental issues. Cadets are required to complete EL 201, EL 402, and four additional courses from a list of environmentally oriented course offerings maintained by the CE Department. Of the four other courses, one must be completed from each of the Liberal Arts, Science, and Engineering Divisions.

ELM minor candidates must obtain the permission of the CE Department head and the head of the department of their major field.

**SUGGESTED COURSE SELECTION FOR
CIVIL ENGINEERING SUBDISCIPLINE CONCENTRATIONS**

Construction Management

CE350 Project Management (required)
 CE403 Foundations (DE)
 CE436 Transportation Planning & Design (DE)
 CE437 Construction Methods & Management (TE)
 CE442 Project Management Design
 GE306 Engineering Geology (BSE)
 1 open Engineering Science Elective
 1 open technical Elective or Independent Research

Environmental Engineering

CE321 Environmental Engineering (required)
 CE406 Groundwater Hydrology & Contamination (ES)
 CE408 Hydraulic Engineering (DE)
 CE412 Env. Engrg. Chemistry (BSE)
 CE415 Env. Engrg. Unit Process Design (DE)
 CE446 Environmental Engineering Design
 2 open Technical Electives or Independent Research

Fluid Mechanics & Hydraulic Engineering

CE309 Fluid Mechanics (required)
 CE408 Hydraulic Engineering (DE)
 CE412 Env. Engrg. Chemistry (BSE)
 CE401 Hydrology (TE)
 CE404 Advanced Fluid Mechanics (ES)
 CE448 Civil Engineering Design
 1 open Design Elective
 1 open Technical Elective or Independent Research

Geotechnical Engineering

CE310 Soil Mechanics (required)
 CE403 Foundations (DE)
 CE406 Groundwater Hydrology & Contamination (ES)
 CE428 Topics in Structural Design (DE)
 CE448 Civil Engineering Design
 GE306 Engineering Geology (BSE)
 2 open Technical Electives or Independent Research

Hydrology & Water Resources Engineering

CE322 Water Resources Engineering (required)
 CE401 Hydrology (ES)
 CE406 Groundwater Hydrology & Contamination (TE)
 CE408 Hydraulic Engineering (DE)
 CE415 Env. Engrg. Unit Process Design (DE)
 CE412 Env. Engrg. Chemistry (BSE)
 CE448 Civil Engineering Design
 1 open Technical Elective or Independent Research

Structural Engineering

CE327 Concrete Design (required)
 CE402 Structural Mechanics (ES)
 CE423 Structural Steel Design (DE)
 CE428 Topics in Structural Design (DE)
 CE429 Advanced Structural theory (TE)
 CE444 Structural Engineering Design
 GE306 Engineering Geology (BSE)
 1 open Technical Electives or Independent Research

Transportation & Planning Engineering

CE333 Transportation Engineering (required)
 CE401 Hydrology (ES)
 CE436 Transportation Planning & Design (DE)
 CE437 Construction Methods & Management (TE)
 CE448 Civil Engineering Design
 GE306 Engineering Geology (BSE)
 1 Design Elective
 1 open Technical Elective or Independent Research

DE = Design Elective
 TE = Technical Elective
 ES = Engineering Science Elective
 BSE = Basic Science Elective

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

- 6 credits of Design Elective from CE403, CE408, CE415, CE423, CE428, CE436
- 3 credits of Basic Science Elective from CE412, GE306, approved CH or PY 300 or 400 courses
- 3 credits of Engineering Science Elective from CE401, CE402, CE404, CE406, CE429, ME311, ME486, EE351, other EE or ME 300 or 400 level courses
- 6 credits of other technical electives from above or CE437, CE443, CE455-460, CE461

SYNOPSIS OF THE CIVIL ENGINEERING CURRICULUM

First Semester		Semester Hrs. Credit	Second Semester		Semester Hrs. Credit
Subject			Subject		
FOURTH (Freshman) CLASS					
CE 101	Intro. to Civil Engr. I	2	CE 102	Intro. to Civil Engr. II	1
CH 117	Lab for CH 137	1	CH 118	Lab for CH 138	1
CH 137	Gen. Chemistry	3	CH 138	Gen. Chemistry	3
EN 101	English Composition I	3	EN 102	English Composition II	3
HI 103	World History	3	HI 104	World History	3
MA 115	Calc. with An. Geom. I	3	MA 116	Calc. with An. Geom. II	3
PE 101	Swimming	1/2	ME 102	Engr. Computer Drawing	1
	AS, MS, or NS	<u>1</u>	PE 102	Boxing	1/2
		16 1/2		AS, MS, or NS	<u>1</u>
					16 1/2
THIRD (Sophomore) CLASS					
CE 202	Surveying	3	MA 326	Probability and Statistics	3
MA 215	Calc. with An. Geom. III	4	CE 206	Solid Mechanics	3
MA 201	Statics	3	CE 311	Elem. Dif. Eq.	3
PE 200	Drug and Alcohol Awareness	1/2	PY 208	Gen Physics II	3
PY 207	General Physics I	3	PY 218	Laboratory for PY 208	1
PY 217	Laboratory for PY 207	1	ME 302	Dynamics	3
SE 300	Public Speaking	1	PE 211	Wrestling	1/2
	AS, MS, or NS	<u>1</u>		AS, MS, or NS	<u>1/2 NS</u>
		16 1/2			17 1/2-18 1/2
SECOND (Junior) CLASS					
CE 301	Struct. Theory	3	CE 307	Engr. Materials	3
CE 304	Civil Engineering Methods	3	CE 319	Water Resources Lab	1
CE 309	Fluid Mechanics	3	CE 322	Water Resources Engr.	3
CE 310	Soil Mechanics	4	CE 327	Concrete Design	3
CE 321	Environmental Engr. I	3	CE 333	Transportation I.	3
PE 300	Prin. Physical Conditioning	1/2	CE 350	Civil Engr. Project Management	3
	AS, MS, or NS	<u>2/1 NS</u>		Physical Education.	1/2
		17 1/2-18 1/2		AS, MS, or NS	<u>2</u>
					18 1/2
FIRST (Senior) CLASS					
CE 451	Seminar and Thesis	1	CE 442,444, 446, or 448	Civil Engr. Design	3
	*Technical Elective (Design)	3		*Technical Elective (Design)	3
	*Technical Elective (Engr. Sc.)	3		*Technical Elective	3
	*Technical Elective (Basic Sc.)	3		*Technical Elective	3
	*Elective (Humanistic-Soc. Sc.)	3		*Elective (Humanistic-Soc. Sc.)	3
	*Elective(Humanistic-Soc. Sc.)	3		Physical Education	1/2
	Physical Education	1/2		AS, MS, or NS	<u>2</u>
	AS, MS, or NS	<u>2</u>			17 1/2
		18 1/2			
Total Hours: 140 (includes 48 hours of civil engineering)					
*Electives are chosen from the distribution requirements shown on the next page.					

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 advisor 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: CS 111, CS 121, CS 122, CS 316, and six semester hours chosen from CS courses numbered 300 or above. The required mathematics courses are MA 118 and either MA 115 or MA 121. A minimum 2.0 GPA must be maintained in both the computer science and the 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 136 semester hours which includes a minimum of 49 hours of computer science. In addition, 12 hours of science/engineering courses with a focus on the scientific method are required. Nineteen (19) hours of mathematics are also required. 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 111, CS 121, CS 122, CS 222, CS 316, CS 326, CS 327, CS 345, CS 411, CS 412, CS 418, CS 441, CS 490, and nine semester hours chosen from CS courses numbered 300 or above.
Humanities/Social Sciences (Economics, English, Fine Arts, History, Modern Languages, Philosophy, Politics, Psychology, and Speech)	31 semester hours to include EN 101, EN 102, HI 103, HI 104, and SE 300
Mathematics	MA 115, MA 116, MA 215, MA 305 and MA 326, CS 221
Science/Engineering	CH 137-117, CH 138-118, and at least 4 semester hours chosen from BI 101, BI 102, BI 205, BI 311, BI 312, CH 223, CH 224, CH 315, CH 351, CH 396, CH 444, PY 207, PY 208, PY 341, PY 342, AT 201, AT 204, AT 301, GE 201, GE 202, GE 204, ME 201, ME 302, ME 311, ME 312, CE 206, CE 309, EE 222, EE 229, and EE 321

SYNOPSIS OF THE B.S. CURRICULUM IN COMPUTER SCIENCE

First Semester		Second Semester	
Subject	Semester Hrs. Credit	Subject	Semester Hrs. Credit
FOURTH (Freshman) CLASS			
CH 117	Lab for CH 137..... 1	CH 118	Lab for CH 138..... 1
CH 137	General Chemistry I 3	CH 138	Gen. Chemistry II 3
CS 111	Intro. to CS 4	CS 121	Programming I 3
EN 101	English Composition I 3	EN 102	English Composition II 3
MA 115	Calc. with An. Geom. I 3	MA 116	Calc. with An. Geom. II 3
PE 101	Swimming 1/2	CS 221	Discrete Mathematics 3
	AS, MS, or NS 1	PE 102	Boxing 1/2
	<u>15 1/2</u>		AS, MS, or NS 1
			<u>17 1/2</u>
THIRD (Sophomore) CLASS			
CS 122	Intro. to Programming II 3	CS 316	Computer Systems 3
CS 222	Discrete Structures 3	CS 326	Data Structures 3
HI 103	World History 3	HI 104	World History 3
MA 215	Calc. with An. Geom. III 4		Elective (Humanities/Social Science) 3
	Elective (Humanities/Social Science) 3		Science/Engineering 4
PE 200	Drug and Alcohol Awareness 1/2	PE 211	Wrestling 1/2
	AS, MS, or NS 1		AS, MS, or NS 1/2 NS
	<u>17 1/2</u>		<u>17 1/2-18 1/2</u>
SECOND (Junior) CLASS			
CS 327	Network Computing 3	CS 345	Software Engineering 3
CS	Elective 3	CS	Elective 3
MA 326	Probability and Statistics 3	MA 305	Linear Algebra 3
	Elective (Humanities/Social Science) 6		Elective (Humanities/Social Science) 6
PE 300	Prin. of Physical Conditioning 1/2		Physical Education. 1/2
	AS, MS, or NS 2/1 NS		AS, MS, or NS 2
	<u>16 1/2-17 1/2</u>		<u>17 1/2</u>
FIRST (Senior) CLASS			
CS 411	Algorithms 3	CS 412	Intro. to Operating Systems 3
CS 441	Formal Lang. and Auto. 3	CS 418	Theory Prog. Lang. 3
CS 490	Research Practicum 3		Electives 9
CS	Elective 3		Physical Education 1/2
SE 300	Public Speaking 1		AS, MS, or NS 2
	Physical Education 1/2		<u>17 1/2</u>
	AS, MS, or NS 2		
	<u>15 1/2</u>		
Total Hours: 136 (includes 49 hours of computer science)			

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 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 general education requirements listed on page 6, cadets must also take general education courses as listed on the next page (12 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 Northern and Conquest Chair endowments, the VMI chapter of Omicron Delta Epsilon (the international honor society in economics), and the Cadet Investment Group that affords actual experience in securities investments.

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

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 203*, EC 300, EC 330, and two additional economics electives, with a grade of "C" or higher. *Competency in statistics can be demonstrated by receiving a "C" or higher in MA 105 and MA 106 or MA 326 in lieu of EC 203.

Economics minor 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 Economics Minor application form

can be obtained from the head of the Department of Economics and Business.

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 201-202, EC 203*, BU 210, BU 220, BU 230, and BU 310 with a grade of C or higher. Business minor 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 Business Minor application form can be obtained from the head of the Department of Economics and Business.

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 Masters-level work in accounting and finance. This option does not change the 136 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, or BU 413.

SYNOPSIS OF THE ECONOMICS AND BUSINESS CURRICULUM

	First Semester	Semester Hrs. Credit	Subject	Second Semester	Semester Hrs. Credit
FOURTH (Freshman) CLASS					
CH 131	Chemical Science I	3	CH 132	Chemical Science II	3
CH 111	Lab for CH 131	1	CH 112	Lab for CH 132	1
EN 101	English Composition I	3	EN 102	English Composition II	3
HI 103	World History	3	HI 104	World History	3
MA 118	Finite Mathematics	3	MA 121	Calculus for EC & BU	3
	Foreign Language	3		Foreign Language	3
PE 101	Swimming	1/2	PE 102	Boxing	1/2
	AS, MS, or NS	1		AS, MS, or NS	1
		17 1/2			17 1/2
THIRD (Sophomore) CLASS					
BU 210	Financial Accounting	3	BU 211	Managerial Accounting	3
BU 216	Legal Environment	3	EC 202	Principles of Macroeconomics	3
BU 220	Principles of Management	3	EC 203	Statistics	3
EC 201	Principles of Microeconomics	3		HI or EN/FA Elective	3
	Foreign Language	3		Foreign Language	3
PE 200	Drug and Alcohol Awareness	1/2	SE 300	Public Speaking	1
	AS, MS, or NS	1	PE 211	Wrestling	1/2
		16 1/2		AS, MS, or NS	1/2 NS
					17 1/2-18 1/2
SECOND (Junior) CLASS					
EC 300	Intermediate Microeconomics	3	BU 312	Principles of Marketing	3
BU 339	Operations Management	3	EC 304	Econometrics	3
BU 310	Business Finance	3	EC 330	Intermediate Macroeconomics	3
	HI Elective	3		PO Elective	3
	EN/FA Elective	3		Physical Education	1/2
PE 300	Prin. Physical Conditioning	1/2		AS, MS, or NS	2
	AS, MS, or NS	2/1 NS			14 1/2
		16 1/2-17 1/2			
FIRST (Senior) CLASS					
	BU Elective	6	BU 440	Business Policy	3
	EC Electives	6		BU Elective	3
	Free Elective	3		EC Electives	6
	Physical Education	1/2		Free Elective	3
	AS, MS, or NS	2		Physical Education	1/2
		17 1/2		AS, MS, or NS	2
					17 1/2

Total Hours: 136 (includes 63 hours of economics and business courses)

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

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

The following courses must be completed with a grade of C or higher: BU 210, 211, 216, 220, 310, 312, 339, 440; EC 201, 202, 203, 300, 303, 304, 330; EN 101, 102; MA 118, 121.

ELECTRICAL ENGINEERING CURRICULUM

Of all professional disciplines, electrical engineering must be regarded as the one which affords graduates the highest level of flexibility in career pursuits. Even a modest list of areas offering employment opportunities is convincing: communications, computer hardware, power generation and distribution, semiconductor manufacturing and design, consumer products, aerospace and defense, instrumentation and test equipment, and biomedical diagnostic equipment as well as the numerous employment opportunities in federal, state, and local governments. Many graduates go on to pursue advanced studies within and outside the discipline. Allied disciplines, such as bioengineering, rely heavily on the skills of the electrical engineer.

The curriculum provides an early foundation in basic sciences, mathematics, and engineering sciences in preparation for the subsequent work in more sophisticated electrical and computer engineering courses. Courses in the senior year provide opportunities to expand knowledge and understanding from background and fundamentals to applications-based design-oriented topics taught in the department. Humanistic-social electives are included to achieve well-rounded and accomplished graduates. Selection of technical electives allows concentration in areas of microelectronics and semiconductor devices, or computer engineering and digital systems design and analysis. Accordingly, the department offers concentrations in the area of Computer Engineering or Microelectronics Engineering. The engineering design experience is distributed throughout electrical engineering courses, providing exposure to the basic elements of design as they apply in each individual course. The required capstone design course in the senior year culminates the design experience emphasizing the full spectrum of professional design considerations (practicality, optimality, reliability, cost, marketability, etc.) applied in formulating and implementing a design to meet specifications under practical constraints. The capstone design course requires the cadets to apply the skills and knowledge they have attained throughout the curriculum. The department maintains well-equipped laboratories, which are utilized extensively to reinforce lecture, reading, and problem solving exercises with practical hands-on experience.

The department sponsors an amateur radio club, a student branch of the Institute of Electrical and Electronics Engineers and a student chapter of the Eta Kappa Nu National Honor Society. The curriculum is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET). Prospective cadets considering electrical engineering as a major may best prepare by taking college preparatory courses in high school, augmented by as many mathematics and science courses as their schedules permit.

The Educational Objectives of the Department are:

- A. The electrical engineering curriculum will produce graduates who are prepared for continuing education, professional growth, and career advancement.
- B. The electrical engineering curriculum will produce graduates who have effective analytical and communications skills.
- C. The electrical engineering curriculum will produce graduates who are able to design components and systems.
- D. The electrical engineering curriculum will produce graduates who have broad laboratory skills, including extensive teamwork and hands-on practical abilities.
- E. The electrical engineering curriculum will produce graduates who are aware of current and emerging technologies and professional engineering practices.

COMPUTER ENGINEERING MINOR

A minor in computer engineering is offered to cadets, not majoring in Electrical Engineering, who desire to complement their major area of study with course work in the area of computer engineering. To qualify for a minor in computer engineering, a cadet must complete a minimum of 15 hours that include EE 229, EE 328, EE 339, and either EE 435 or EE 445. A grade of C or better must be obtained in each course. To become a candidate for the minor in computer engineering, a cadet must obtain the approval of the head of the Department of Electrical and Computer Engineering and the approval of the head of the department from their major field.

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING CONCENTRATIONS

A cadet may elect to obtain an optional concentration in either Computer Engineering or Microelectronics Engineering. The required courses for the concentrations are given below. Each course must be passed with a grade of C or above. Cadets should choose the concentration area at the beginning of the Second Class year. To better prepare for a possible concentration in either of these areas, cadets should choose a technical elective in their Third Class year that is compatible with or supports the concentration area.

COMPUTER ENGINEERING CONCENTRATION

EE 328 Digital Systems and Computer Design (3-2-4)
EE 339 Microcontrollers (3-2-4)
EE 431 Digital Signal Processing (3-2-4)
EE 435 Fault Tolerant Computing (2-2-3)
EE 445 Computer Networks (2-2-3)
300-400 CS Course (3-0-3) (with department approval)
Total credits 21

MICROELECTRONICS ENGINEERING CONCENTRATION

EE 325 Electromagnetic Fields (3-0-3)
EE 355 Electronics I (3-2-4)
EE 356 Electronics II (3-2-4)
EE 413 Microelectronics (2-2-3)
EE 426 Semiconductor Devices (2-2-3)
300-400 PY course (with department approval)
Total credits 20

NOTE: In either concentration, all courses must be passed with grade of C or above.

NON-EE TECHNICAL ELECTIVES

Two three credit hour non-EE technical electives are to be chosen from courses offered from the Engineering Division (Mechanical Engineering or Civil Engineering) and/or the Science Division (Biology, Chemistry, Physics, or Computer Science). One technical elective must be a 300 level or above course and the other a 200 level or above course. The electives chosen are dependent on approval of the respective department, satisfactory completion of any prerequisite requirements and must be part of a planned educational objective. Consultation and approval of the academic advisor is required

HUMANISTIC-SOCIAL SCIENCE ELECTIVES

Nine credits in Humanities and Social Science electives may be selected from 200-level or higher in economics (EC), English (EN), fine arts (FA), history (HI), philosophy (PH), psychology (PS), political science (PO), or theology (TH); courses at the 100-level may be selected in modern languages. Thesis, seminars, independent research, special projects, management, and skill courses, such as accounting, are not acceptable.

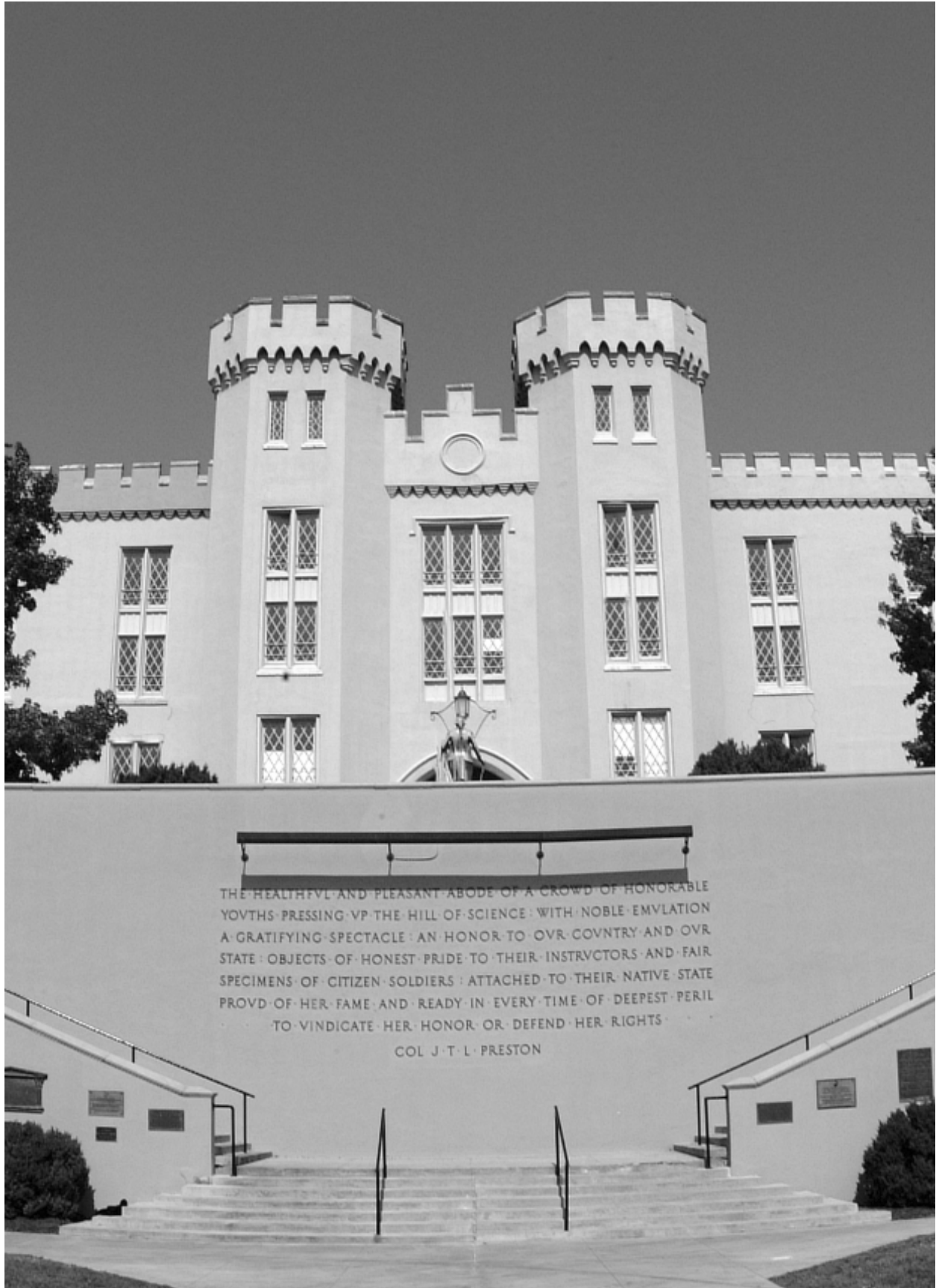
SENIOR EE ELECTIVES

Courses listed below may be used as electrical engineering electives in the senior year, provided the cadet's curriculum plan for the year is acceptable to the department head:

EE 406 Microcontrollers II
EE 413 Microelectronics
EE 426 Semiconductor Devices
EE 435 Fault Tolerant Computing
EE 445 Computer Networks
EE 482 Digital Controls Systems
EE 486 Microwave Theory and Techniques
EE 488 Electro-optics
EE 491/492 Independent Research
ME 444 Mechanical Engineering Design

SYNOPSIS OF THE ELECTRICAL ENGINEERING CURRICULUM

First Semester		Semester Hrs. Credit	Second Semester		Semester Hrs. Credit
Subject			Subject		
FOURTH (Freshman) CLASS					
CH 117	Lab for CH 137.....	1	CH 118	Lab for CH 138.....	1
CH 137	General Chemistry	3	CH 138	Gen. Chemisty	3
EE 101	Intro. to ECE.....	1	EN 102	English Composition II*.....	3
EN 101	English Composition I*.....	3	EE 104	Computer Tools	2
HI 103	World History	3	HI 104	World History	3
MA 115	Calc. I*	3	MA 116	Calc. II	3
PE 101	Swimming	1/2	PE 102	Boxing	1/2
	AS, MS, or NS	<u>1</u>		AS, MS, or NS	<u>1</u>
		15 1/2			16 1/2
THIRD (Sophomore) CLASS					
EE 222	Elec. Cir. Analysis I*	3	EE 223	Elec. Cir. Analysis II	4
MA 215	Calc. with An. Geom. III	4		H/S Elective** (Non-NS cadets only)....	3
MA 311	Elem. Diff. Equations	3	EE 229	Intro. Digital Circuits	4
PY 207	General Physics	4	PY 208	General Physics	4
CS 340	C Programming	3	CS 221	Discrete Mathematics I.....	3
SE 300	Public Speaking	1	PE 211	Wrestling	1/2
PE 200	Drug and Alcohol Awareness	1/2		AS, MS, or NS	<u>1/2 NS</u>
	AS, MS, or NS	<u>1</u>			16 1/2 -19 1/2
		19 1/2			
SECOND (Junior) CLASS					
EE 325	Electromagnetic Fields	3	EE 321	Systems Design I	3
EE 328	Digital Systems and Computer Design ..	4	EE 330	Signals and Systems	3
MA 326	Prob. and Statistics	3	EE 339	Microcontrollers	4
EE 355	Electronics I	4	EE 356	Electronics II	4
	Humanistic-Social Elective	3		Humanistic-Social Elective	3
PE 300	Prin. Physical Conditioning	1/2		Physical Education	1/2
	AS, MS, or NS	<u>2/1 NS</u>		AS, MS, or NS	<u>2</u>
		18 1/2 -19 1/2			19 1/2
FIRST (Senior) CLASS					
EE 431	Dig. Signal Proc.	4		Technical Elective	3
EE 470	Seminar	1/2		Elec. Engr. Elective	3
EE 481	Controls	4	EE 472	Communications	4
EE 422	Systems Design II	3		Humanistic Social Elective	3
	Electrical Engineering Elective	3		Physical Education	1/2
	Physical Education	1/2		AS, MS, or NS	<u>2</u>
	AS, MS, or NS	<u>2</u>			15 1/2
		17		HS Elective (for NS cadets)	<u>3</u>
					18 1/2
<p>Total Hours: 142.5 (includes 60.5 hours of electrical engineering)</p> <p>* Requires a grade of C or better.</p> <p>** Navy ROTC cadets only – H/S Elective should be taken during a cadet's first class year.</p> <p>Must have 9 credits in humanistic-social electives and 6 credits of non EE technical electives.</p>					



THE HEALTHFUL AND PLEASANT ABODE OF A CROWD OF HONORABLE
YOUTHS PRESSING UP THE HILL OF SCIENCE WITH NOBLE EMULATION
A GRATIFYING SPECTACLE AN HONOR TO OUR COUNTRY AND OUR
STATE OBJECTS OF HONEST PRIDE TO THEIR INSTRUCTORS AND FAIR
SPECIMENS OF CITIZEN SOLDIERS ATTACHED TO THEIR NATIVE STATE
PROUD OF HER FAME AND READY IN EVERY TIME OF DEEPEST PERIL
TO VINDICATE HER HONOR OR DEFEND HER RIGHTS

COL J. T. L. PRESTON

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, and the sciences. With twenty-seven hours of 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, 202, 209, and any three upper-level English 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: EN 347 (Advanced Composition) and five of the following courses: EN 330, EN 332, EN 334, EN 340, EN 342, EN 345, EN 401, EN 406, EN 468, EN 470, EN 473W-474W, and EN 496. 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” is attached to the course number). A cadet

majoring in English may earn a concentration in writing by meeting these same requirements.

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 a number of trips each year to see plays and films, visit museums, and hear concerts. Each year during Spring Furlough the Department sponsors a trip to England for English majors and minors. Eligible English majors and minors may join Sigma Tau Delta, an international honor society.

SPECIAL REQUIREMENTS FOR ENGLISH MAJORS

- 1) One foreign language through the second-year level.
- 2) Two fine arts lecture courses (6 hours).
- 3) HI 307 and 308 — English History (6 hours).
- 4) PH 201 and 202 — History of Philosophy (6 hours).
- 5) EN 201* and 202* — Survey of English Literature (6 hours).
- 6) EN 209* — American Literature Survey (3 hours)
- 7) EN 374 — Classics in Translation (3 hours).
- 8) 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)
- 9) Two American Period courses: EN 350, EN 352, EN356, EN 360, EN 363 (6 hours)
- 10) Any three additional EN courses, including those listed in (8) which are not counted in that requirement. (9 hours)
- 11) 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 311, CH 246, CH 396, EL 201, EL 402, GE 201, GE 202, GE 204, PY 201, PY 202, PY 322, or PY 323.
- 12) Additional electives in English or any other subject (of which 9 hours must be in non-English courses) to make up the total of 136 hours required for graduation.
- 13) First classmen are required to receive a passing grade on a senior portfolio.

*Minimum grade of C required.

SYNOPSIS OF THE ENGLISH CURRICULUM

First Semester		Second Semester	
Subject	Semester Hrs. Credit	Subject	Semester Hrs. Credit
FOURTH (Freshman) CLASS			
CH 111	Lab for CH 131 1	CH 112	Lab for CH 132. 1
CH 131	Chemical Sci. I 3	CH 132	Chemical Sci. II 3
EN 101	English Composition I* 3	EN 102	English Composition II* 3
HI 103	World History 3	HI 104	World History 3
MA 105	Intro. Prob. & Stat. I 3	MA 106	Intro. Prob. & Stat II 3
PE 101	Swimming 1/2	PE 102	Boxing 1/2
	Foreign Language 3		Foreign Language 3
	AS, MS, or NS 1		AS, MS, or NS 1
	<u>17 1/2</u>		<u>17 1/2</u>
THIRD (Sophomore) CLASS			
EN 201	English Literature* 3	EN 202	English Literature* 3
EN 209	American Literature* 3	HI 308	English History 3
HI 307	English History 3	SE 300	Public Speaking 1
	Elective (FA) 3		Elective (FA) 3
	Foreign Language 3		Science Elective 3
PE 200	Drug & Alcohol Abuse Awareness 1/2		Foreign Language 3
	AS, MS, or NS 1	PE 211	Wrestling 1/2
	<u>16 1/2</u>		AS, MS, or NS 1/2 NS
			<u>17 1/2-18 1/2</u>
SECOND (Junior) CLASS			
EN 374	Classics in Trans 3	PH 202	Modern Philosophy 3
PH 201	Greek and Med. Phil 3		Elective (Pre-1900) 3
	Elective (American Period) 3		Elective (Other EN) 3
	Elective (Pre-1900) 3		Elective (Other EN) 3
	Elective 3		Elective 3
PE 300	Principles of Physical Conditioning 1/2		Physical Education 1/2
	AS, MS, or NS 2/1 NS		AS, MS, or NS 2
	<u>16 1/2-17 1/2</u>		<u>17 1/2</u>
FIRST (Senior) CLASS			
	Elective (American Period) 3		Elective (Non EN) 3
	Elective (Other EN) 3		Elective 3
	Elective (Non EN) 3		Elective 3
	Elective (Non EN) 3		Elective 3
	Elective 3		Physical Education 1/2
	Physical Education 1/2		AS, MS, or NS 2
	AS, MS, or NS 2		<u>14 1/2</u>
	<u>17 1/2</u>		
Total Hours: 136 (includes 39 hours of required upper-level EN/FA 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 and Far Eastern, 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. Students in all 400-level courses research and write a major undergraduate paper.

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 those 300-level courses designated as methodologically intensive, students 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 Senior Thesis 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 the next page.

Institute Core Curriculum: Note that EN 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 history department. 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. Writing-intensive courses are not designated in this catalogue, but all 400-level courses are writing-intensive and are recognized as such by the Institute's Committee for Writing Across the Curriculum.

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, 460.

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 category.

Introduction to Methodology: History majors must take at least one 300-level course designated as methodologically intensive. This course must be completed prior to enrollment in HI 460. It may also

fulfill a regional requirement. Cadets completing this requirement must demonstrate ability to construct an annotated bibliography and to cite sources in accordance with departmental standards.

Capstone Course: History majors must take HI 460, preferably in the fall of the First Class year. The history department may direct individuals to enroll in HI 460 in either fall or spring semester, however. The course requires a major research paper. Topics for the course will vary. The course has a prerequisite of at least one completed methodologically-intensive course. (Note: individual sections of HI 460 may have additional prerequisites.) Substitutions for HI 460 are rare but 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, 491, and 492.

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 of the following courses (or others approved by the head of the history department). AT 201, AT 204, BI 215, BI 311, BI 312, CH 464, EL 201, EL 402, GE 201, GE 202, GE 204, PY 201, PY 202, PY 322, or PY 323.

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.

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 complete the departmental core curriculum courses of HI 103, 104, 205 or 205W, and 206, plus HI 372, 491, and 492. Honors candidates must complete one methodologically-intensive course from a region outside that of their thesis, plus additional courses for a total of thirty-three hours of history courses.

SYNOPSIS OF THE HISTORY CURRICULUM

First Semester		Semester Hrs. Credit	Second Semester		Semester Hrs. Credit
Subject			Subject		
FOURTH (Freshman) CLASS					
CH 111	Lab for CH 131	1	CH 112	Lab for CH 132	1
CH 131	Chemical Science I	3	CH 132	Chemical Sci. II	3
EN 101	English Composition I	3	EN 102	English Composition II	3
HI 103	World History	3	HI 104	World History	3
MA 105	Intro. Prob. & Stat. I	3	MA 106	Intro. Prob. & Stat. II	3
PE 101	Swimming	1/2		Foreign Language	3
	Foreign Language	3	PE 102	Boxing	1/2
	AS, MS, or NS	1		AS, MS, or NS	1
		17 1/2			17 1/2
THIRD (Sophomore) CLASS					
EC 201	Principles of Microeconomics	3	EC 202	Principles of Macroeconomics	3
	English Elective	3		English Elective	3
HI 205	History of the U.S.	3	HI 206	History of the U.S.	3
	Science Elective	3		Science Elective	3
	Foreign Language	3		Foreign Language	3
PE 200	Drug and Alcohol Awareness	1/2	PE 211	Wrestling	1/2
	AS, MS, or NS	1		AS, MS, or NS	1/2 NS
		16 1/2			16 1/2-17 1/2
SECOND (Junior) CLASS					
	Restricted Elective	3		Restricted Elective	3
	Electives (HI)	6		Electives (HI)	6
	Elective	3		Elective	3
	Foreign Language	3		Foreign Language	3
PE 300	Prin. Physical Conditioning	1/2		Physical Education	1/2
SE 300	Public Speaking	1		AS, MS, or NS	2
	AS, MS, or NS	2/1 NS			17 1/2
		17 1/2-18 1/2			
FIRST (Senior) CLASS					
	Restricted Elective	3		Restricted Elective	3
HI 460	Capstone Experience	3		Electives (HI)	6
	Electives	6		Elective (Non-HI)	3
	Elective (Non-HI)	3		Physical Education	1/2
	Physical Education	1/2		AS, MS, or NS	2
	AS, MS, or NS	2			14 1/2
		17 1/2			
Total Hours: 136 (includes 33 hours of history)					

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. The department's Internship Coordinator assists cadets with internship opportunities.

INTERNATIONAL STUDIES CURRICULUM REQUIREMENTS

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

Institute Core Curriculum: Note that EN 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 103-104, 205-206, PO 201, 314, 325, 331, 333, 389, 434, PO 326 or HI 324 or 325, and EC 306.

Political Science (PO) electives should be filled with any PO course offered by the Department of International Studies and Political Science.

History electives may be filled from the following courses: HI 307, 308, 319, 324, 325, 330, 333, 334, 344, 346, 335, 348, 350, 356, 361, 365, 368, 373, 374, 375, 382, 435, 451, 452, 453, 454, and 474.

Economics electives may be filled from the following courses: EC 401, 404, 410, and BU 306.

English electives should be filled with any literature course at VMI, as well as EN 330, EN 332, EN 340, EN 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, and (Science and Security) SS 340, SS 341, SS 342, SS 343, SS 344, and SS 345.

The minimum foreign language requirement for majors is one foreign language through the 300 level, 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.

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 PO 326 or HI 324, or HI 325, and PO 325 and PO 333.

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 PO 326 can complete the minor with 18 credit hours.

MINOR IN SCIENCE AND SECURITY

The Science & Security (SS) minor is open to all majors and is administered by the director of Science and Security in the Department of International Studies. SS courses may also be taken as electives without the minor.

Purpose: The Science & Security minor integrates the study of engineering, science, and social science to produce graduates prepared for careers in national and homeland security, including positions in government agencies (FBI, CIA, DIA, NSA, and the Department of Homeland Security), private research and public policy institutes (Institute for Defense Analysis, Center for Strategic and International Studies, ANSER, and

RAND), and in the legislative branch as congressional aides and on committee and sub-committee staffs.

Requirements: Admission to the minor requires the approval of the cadet's major adviser, department head, and the director of Science & Security. Cadets must complete six 3 credit hour courses (total of 18 credit hours) as follows: **Required:** SS 360 (IS) National Security and Homeland Defense Seminar, SS 347 (IS) Science Technology and International Relations, and SS 358 (Interdisciplinary) Capstone Research Experience. Cadets must complete three more courses from the following: SS 340 (BI) Biological Agents in Warfare and Terrorism, SS 341 (CE) Environmental Terrorism, SS 342 (CH) Chemical/Radiological Agents & their Forensic Detection, SS 342 (CS) Computer Forensics, SS 344 (MA), The Making and Breaking of Codes, and SS 345 (CS) Information Security.

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 our World Wide Web site: <http://www.vmi.edu/interstudies/>

SYNOPSIS OF THE INTERNATIONAL STUDIES AND POLITICAL SCIENCE CURRICULUM

	First Semester	Semester Hrs. Credit		Second Semester	Semester Hrs. Credit
Subject			Subject		
FOURTH (Freshman) CLASS					
CH 111	Lab for CH 131.	1	CH 112	Lab for CH 132.	1
CH 131	Chemical Science I	3	CH 132	Chemical Sci. II	3
EN 101	English Composition I	3	EN 102	English Composition II	3
HI 103	World History	3	HI 104	World History	3
MA 105	Intro. Prob. & Stat. I	3	MA 106	Intro. Prob. and Stat. II	3
	Foreign Language	3		Foreign Language	3
PE 101	Swimming	1/2	PE 102	Boxing	1/2
	AS, MS, or NS	1		AS, MS, or NS	1
		<u>17 1/2</u>			<u>17 1/2</u>
THIRD (Sophomore) CLASS					
EC 201	Principles of Microeconomics	3	EC 202	Principles of Macroeconomics	3
	English Elective	3		English Elective	3
HI 205	History of the U.S.	3	HI 206	History of the U.S.	3
PO 201	Intro. to International Studies	3	PO 325	International Politics	3
	Foreign Language	3		Foreign Language	3
PE 200	Drug and Alcohol Awareness	1/2	PE 211	Wrestling	1/2
	AS, MS, or NS	1		AS, MS, or NS	1/2 NS
		<u>16 1/2</u>			<u>16 1/2-17 1/2</u>
SECOND (Junior) CLASS					
EC 306	International Econ.	3	PO 314	American Govt.	3
PO 333	Natl. Security Affairs	3		Elective (HI)	3
PO 389	Tech. of Comp. Analysis	3		Science Elective	3
SE 300	Public Speaking	1		Elective	3
	Foreign Language	3		Foreign Language	3
PE 300	Prin. Physical Conditioning	1/2		Physical Education	1/2
	AS, MS, or NS	2/1 NS		AS, MS, or NS	2
		<u>14 1/2-15 1/2</u>			<u>17 1/2</u>
FIRST (Senior) CLASS					
PO 326	American Foreign Policy OR		PO 331	Political Theory	3
HI 324/325	American Foreign Relations	3	PO 434	For. Defense Pol. Sem.	3
	Electives (PO)	6		Elective (EC)	3
	Elective (HI)	3		Electives	6
	Elective	3		Physical Education	1/2
	Physical Education	1/2		AS, MS, or NS	2
	AS, MS, or NS	2			<u>17 1/2</u>
		<u>17 1/2</u>			
Total Hours: 136 (includes 27 hours of political science)					

MATHEMATICS CURRICULA

Two programs in mathematics lead to a degree: one stresses the humanities and leads to the bachelor of arts degree in mathematics; the other emphasizes the sciences and leads to the bachelor of science degree in mathematics. Both degrees require the same number of hours in mathematics.

The aims of the department are:

- (1) To prepare the cadet for positions in business, industry, and government service; for teaching; for graduate study; for entering professional schools such as law, medicine, business administration, or engineering.
- (2) To promote understanding in several basic fields of mathematics so that the cadet:
 - (I) Becomes familiar with their structures and major concepts;
 - (II) Acquires proficiency in their techniques;
 - (III) Develops an appreciation and an understanding of the nature of mathematics as an independent subject as well as one with extensive applications.
- (3) To plan and present those courses in mathematics that are required by the various degree-granting departments.

In general, the B.A. curriculum is recommended for the cadet who is interested in a general education in

the liberal arts and sciences; the B.S. curriculum is for the cadet who wishes to develop his/her interests in one or more of the sciences.

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 115, MA 116, MA 118, MA 215, MA 216, and three additional courses chosen from mathematics courses numbered 300 or above, or PH 301. It is acceptable to replace MA 118 with PH 301, or a mathematics course numbered 300 or above. At least a 2.0 GPA must be maintained in courses for the minor.

To become a candidate for the minor, the cadet must obtain the approval of both the head of the mathematics and computer science department and the head of the department in the major field.

REQUIREMENTS FOR B.S. AND B.A. DEGREES IN MATHEMATICS

Both the B.S. and B.A. degrees require 135 semester hours which includes a minimum of 45 hours of mathematics. The following outline gives minimum requirements for each degree. Additional courses to

complete the requirement must be chosen by the cadet with the approval of his/her departmental adviser. No single course may be used to satisfy requirements in two areas.

AREA	REQUIREMENTS	
	B.S. DEGREE	B.A. DEGREE
MATHEMATICS	MA 115, MA 116, MA 118, MA 215 MA 216, MA 301 or MA 304, MA 303 MA 305, MA 311, MA 326, MA 401, and 12 semester hours chosen from math courses numbered 300 or above, PH 301, and, at most, 3 hours from computer science courses numbered 300 or above.	Same as the B.S. Degree.
SCIENCE (Astronomy, Biology, Chemistry, Geology, Physics)	22 semester hours (excluding one-hour courses) to include 6 courses chosen from at least 2 different sciences with at least 3 courses in one field. Four of the 6 courses must be laboratory courses. CH 111-131 and CH 112-132, or CH 125-135 and CH 126-136, or CH 117-137 and CH 118-138 are required.	CH 111-131 and CH 112-132, or CH 117-137 and CH 118-138.
MODERN LANGUAGES	6 hours at the 200-level or higher in one of French, German, Spanish, Japanese, or Arabic.	Same as the B.S. Degree.
ENGLISH (Includes Fine Arts and Speech)	9 semester hours to include EN 101 and EN 102; SE 300.	15 semester hours to include EN 101 and EN 102; SE 300.
SOCIAL SCIENCES (Economics, History Political Science, Philosophy, Sociology, Psychology)	HI 103 and HI 104 and 6 additional hours chosen from any of the disciplines listed except history.	HI 103 and HI 104 and 12 additional hours chosen from any of the disciplines listed, with not more than 6 of these hours from any one discipline.
MILITARY SCIENCE	12 semester hours	12 semester hours.
PHYSICAL EDUCATION	4 semester hours.	4 semester hours.

SYNOPSIS OF THE B.S. CURRICULUM IN MATHEMATICS

First Semester		Semester Hrs. Credit	Second Semester		Semester Hrs. Credit
Subject			Subject		
FOURTH (Freshman) CLASS					
CH 117	Lab for CH 137.....	1	CH 118	Lab for CH 138.....	1
CH 137	General Chemistry	3	CH 138	General Chemistry	3
EN 101	English Composition I	3	EN 102	English Composition II	3
HI 103	World History	3	HI 104	World History	3
MA 115	Calc. with An. Geom I.....	3	MA 116	Calc. with An. Geom. II	3
PE 101	Swimming	1/2	MA 118	Finite Math	3
	AS, MS, or NS	<u>1</u>	PE 102	Boxing	1/2
		<u>14 1/2</u>		AS, MS, or NS	<u>1</u>
					<u>17 1/2</u>
THIRD (Sophomore) CLASS					
MA 215	Calc. with An. Geom III	4	MA 216	Calc. with An. Geom. IV	2
	Mathematics/Computer Sci.	3		Mathematics/Computer Sci.	3
	Science	4		English	3
	Language	3		Science	4
	Elective	3		Language	3
PE 200	Drug and Alcohol Awareness.....	1/2	PE 211	Wrestling	1/2
	AS, MS, or NS	<u>1</u>		AS, MS, or NS	<u>1/2 NS</u>
		<u>18 1/2</u>			<u>16 1/2-17 1/2</u>
SECOND (Junior) CLASS					
MA 311	Mathematics/Computer Sci.*	3		Mathematics*	6
	Elem Dif. Eq.	3		Language	3
	Language	3		Science	3
	Science	3		Elective	3
	Elective	3		Physical Education	1/2
PE 300	Prin. Physical Cond.	1/2		AS, MS, or NS	<u>2</u>
	AS, MS, or NS	<u>2/1 NS</u>			<u>17 1/2</u>
		<u>16 1/2-17 1/2</u>			
FIRST (Senior) CLASS					
	Mathematics*	6	SE 300	Mathematics*	6
	Social Science Elective	3		Public Speaking	1
	Electives	6		Social Science Elective.....	3
	Physical Education	1/2		Electives	3
	AS, MS, or NS	<u>2</u>		Physical Education	1/2
		<u>17 1/2</u>		AS, MS, or NS	<u>2</u>
					<u>15 1/2</u>
Total Hours: 135 (includes 45 hours of mathematics)					
* To be chosen from elective and required mathematics courses offered that semester.					

SYNOPSIS OF THE B.A. CURRICULUM IN MATHEMATICS

First Semester		Semester Hrs. Credit	Second Semester		Semester Hrs. Credit
Subject			Subject		
FOURTH (Freshman) CLASS					
CH 117	Lab for CH 137.....	1	CH 118	Lab for CH 138.....	1
CH 137	General Chemistry	3	CH 138	General Chemistry	3
EN 101	English Composition I	3	EN 102	English Composition II	3
HI 103	World History	3	HI 104	World History	3
MA 115	Calc. with An. Geom I.....	3	MA 116	Calc. with An. Geom. II	3
PE 101	Swimming	1/2	MA 118	Finite Math	3
	AS, MS, or NS	1	PE 102	Boxing	1/2
		<u>14 1/2</u>		AS, MS, or NS	1
					<u>17 1/2</u>
THIRD (Sophomore) CLASS					
MA 215	Calc. with An. Geom III	4	MA 216	Calc. with An. Geom. IV	2
	Mathematics/Computer Sci.	3		Mathematics/Computer Sci.	3
	English	3		English	3
	Language	3		Language	3
	Social Science Elective	3		Social Science Elective.....	3
PE 200	Drug and Alcohol Awareness	1/2	PE 211	Wrestling	1/2
	AS, MS, or NS	1		AS, MS, or NS	1/2 NS
		<u>17 1/2</u>			<u>15 1/2-16 1/2</u>
SECOND (Junior) CLASS					
MA 311	Mathematics/Computer Sci.*	3		Mathematics*	6
	Elem Dif. Eq.	3		Language	3
	Language	3		Social Science Elective	3
	Social Science Elective	3		English	3
	Elective	3		Physical Education	1/2
PE 300	Prin. Physical Cond.	1/2		AS, MS, or NS	2
	AS, MS, or NS	2/1 NS			<u>17 1/2</u>
		<u>16 1/2-17 1/2</u>			
FIRST (Senior) CLASS					
	Mathematics*	6		Mathematics*	6
	Electives	9	SE 300	Public Speaking	1
	Physical Education	1/2		Electives	8
	AS, MS, or NS	2		Physical Education	1/2
		<u>17 1/2</u>		AS, MS, or NS	2
					<u>17 1/2</u>
Total Hours: 135 (includes 45 hours of mathematics)					
* To be chosen from elective and required mathematics courses offered that semester.					

MECHANICAL ENGINEERING CURRICULUM

Mechanical engineering is the second oldest of the engineering professions and has the second 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. Maximum exposure to courses in civil and electrical engineering is given. Extensive use is made of the computer facilities at VMI. Enough electives are available so that a cadet is able to choose a wide selection of courses outside of the major field.

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

1. the ability to identify, formulate, and solve engineering problems in both thermal/fluids, mechanical design and related areas; and
2. the professional skills and awareness necessary to responsibly practice engineering in both a technical and societal context.

Program Outcomes. The mechanical engineering program will graduate students with the following abilities:

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

2. Graduates will have the ability to analyze, and design mechanical and thermal systems, components and processes.
3. Graduates will have the ability to design and conduct experiments, and to analyze and interpret experimental results.
4. Graduates will have the ability to use modern computational and analytical techniques, skills, and tools.
5. Graduates will have effective oral and written communication skills.
6. Graduates will have the ability to incorporate applicable engineering standards and realistic constraints in engineering design.
7. Graduates will have the ability to effectively function on multidisciplinary teams.
8. Graduates will have an understanding of their professional and ethical responsibilities.
9. 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; Instrumentation Lab; Manufacturing and Robotics Lab; Materials Lab. Laboratories are designed as an extension of classroom work and provide futuristic 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 (Accreditation Board for Engineering and Technology).

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.

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 309, ME 311, and 3 of the following 4 courses, ME 413, ME 415, ME 416, and ME 417 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 309 Fluid Mechanics (3-0-3)

ME 311 Thermodynamics (3-0-3)

Also must complete 3 of the following 4 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)

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 MECHANICAL ENGINEERING CURRICULUM

First Semester		Second Semester	
Subject	Semester Hrs. Credit	Subject	Semester Hrs. Credit
FOURTH (Freshman) CLASS			
CH 117	Lab for CH 137..... 1	CH 118	Lab for CH 138..... 1
CH 137	Chemistry I..... 3	CH 138	Chemistry II..... 3
EN 101	English Composition I..... 3	EN 102	English Composition II..... 3
HI 103	History..... 3	HI 104	History..... 3
MA 115	Calc. with An. Geom. I..... 3	MA 116	Calc. with An. Geom. II..... 3
ME 105	Intro. to Mech. Eng..... 1	ME 203	Programming Tools for M.E.'s..... 2
ME 109	CAD/Solid Model..... 1	PE 102	Boxing..... 1/2
PE 101	Swimming..... 1/2	AS, MS, or NS	..... 1
	AS, MS, or NS..... 1		..... 16 1/2
	<u>16 1/2</u>		
THIRD (Sophomore) CLASS			
MA 118	Finite Math..... 3	ME 204	System Dynamics..... 3
MA 215	Calc. with An. Geom. III..... 4	ME 206	Solid Mechanics..... 3
ME 201	Statics..... 3	ME 305	Science of Materials..... 3
PY 207	Gen. Physics I..... 3	ME 311	Thermodynamics..... 3
PE 200	Drug and Alcohol Awareness..... 1/2	PY 208	Gen. Physics II..... 3
PY 217	Physics Lab..... 1	PE 211	Wrestling..... 1/2
	AS, MS, or NS..... 1	PY 218	Physics Lab II..... 1
	..... 1	AS, MS, or NS	..... 1/2 NS
	<u>15 1/2</u>		..... 17 1/2-18 1/2
SECOND (Junior) CLASS			
EC 322	Engr. Economy..... 2	EE 352	Elec. & Electro. Devices..... 3
EE 351	Elec. Cir. & Machines..... 3	ME 309	Fluid Mechanics..... 3
MA 311	Diff. Eq..... 3	ME 321	Dynamics of Machinery..... 3
ME 302	Dynamics..... 3	ME 332	Heat and Mass Transfer..... 3
ME 312	Thermodynamics II..... 3	ME 334	Mech. Engr. Energy Lab..... 1
ME 325	Instrumentation Lab..... 2		Humanistic-Social Elective..... 3
PE 300	Prin. Physical Cond..... 1/2		Physical Education..... 1/2
	AS, MS, or NS..... 2/1 NS		AS, MS, or NS..... 2
	..... 2		..... 18 1/2
	<u>17 1/2-18 1/2</u>		
FIRST (Senior) CLASS			
ME 421	Energy Conver. Design..... 3	ME 444	Mechanical Engr. Design..... 3
ME 425	Mech. Design..... 4	ME 458	Seminar..... 1/2
ME 457	Seminar..... 1/2		ME Technical Elective..... 3
SE 300	Public Speaking..... 1		Technical Elective..... 3
	ME Technical Elective..... 3		Humanistic-Social Electives..... 6
	Technical Elective..... 3		Physical Education..... 1/2
	Physical Education..... 1/2		AS, MS, or NS..... 2
	AS, MS, or NS..... 2		..... 18
	..... 2		
	<u>17</u>		
<p>Total Hours: 138 (includes 54 hours of specified mechanical engineering courses)</p> <p>Electives are chosen from the distribution requirements shown on the next page.</p>			

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

Twelve (12) hours minimum course work selected from the following list. At least six credits must be selected from the ME Group and the remaining six credits from the ME Group or the Technical Group.:

ME GROUP:

ME	412	Solar Energy
ME	413	Aircraft Propulsion Systems
ME	414	Turbomachinery
ME	415	Flight Mechanics
ME	416	Fundamentals of Aerodynamics
ME	417	Aircraft Structural Analysis
ME	418	Thermal Environment Engineering
ME	427	Introduction to Automated Manufacturing Systems
ME	431	Power Plant Design
ME	480	Internal Combustion Engines
ME	484	Fiber Reinforced Composite Materials
ME	485	Advanced Mechanical Design
ME	486-490	Topics in Mechanical Engineering

TECHNICAL GROUP:

ME	255 & 256	Summer Research
ME	355 & 356	Summer Research
ME	455 & 456	Summer Research
ME	443	ME Design Competition
ME	461 & 462	Independent Research

Other technical courses may be 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 advisor in consultation with the mechanical engineering department head.

HUMANITIES AND SOCIAL SCIENCE ELECTIVES

Nine (9) minimum hours or three (3) courses, 200-level and above, selected from economics (EC), English (EN), fine arts (FA), history (HI), philosophy (PH), political science (PO), or psychology (PS). Courses in the 100-level may be selected in modern languages (ML).

MODERN LANGUAGES AND CULTURES CURRICULUM

The Department of Modern Languages and Cultures offers an interdisciplinary major that requires in-depth study of a foreign language 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 24 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 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.

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).

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 MODERN LANGUAGES AND CULTURES CURRICULUM

First Semester		Semester Hrs. Credit	Second Semester		Semester Hrs. Credit
Subject			Subject		
FOURTH (Freshman) CLASS					
CH 111	Lab for CH 131	1	CH 112	Lab for CH 132	1
CH 131	Chemical Science I	3	CH 132	Chem Science II	3
EN 101	English Composition I	3	EN 102	English Composition II	3
HI 103	World History	3	HI 104	World History	3
MA 105	Intro. Prob & Statistics	3	MA 106	Intro. Prob & Statistics	3
ML	.....	3	ML	.....	3
PE 101	Swimming	1/2	PE 102	Boxing	1/2
	AS, MS, or NS	1		AS, MS, or NS	1
		<u>17 1/2</u>			<u>17 1/2</u>
THIRD (Sophomore) CLASS					
EC 201	Principles of Microeconomics	3	EC 202	Principles of Macroeconomics	3
	EN or FA Elective	3		EN or FA Elective	3
	Science Elective	3	HI 325	Am. For Relations	3
ML	.....	3	ML	.....	3
	Elective	3		Elective	3
PE 200	Drug and Alcohol Awareness	1/2	SE 300	Public Speaking	1
	AS, MS, or NS	1	PE 211	Wrestling	1/2
		<u>16 1/2</u>		AS, MS, or NS	1/2 NS
					<u>17 1/2-18 1/2</u>
SECOND (Junior) CLASS					
EC 306	International Economics	3	HI*	.....	3
HI*	.....	3	ML	.....	3
ML	.....	3	ML	.....	3
ML	.....	3		Elective	3
	Elective	3	PO 325	International Politics	3
PE 300	Principles of Physical Conditioning	1/2		Physical Education	1/2
	AS, MS, or NS	2/1 NS		AS, MS, or NS	2
		<u>16 1/2-17 1/2</u>			<u>17 1/2</u>
FIRST (Senior) CLASS					
ML	.....	3	ML	.....	3
ML	.....	3	ML	.....	3
PO**	.....	3		Elective	3
	Elective	3		PO Elective	3
	Elective	3		Physical Education	1/2
	Physical Education	1/2		AS, MS, or NS	2
	AS, MS, or NS	2			<u>14 1/2</u>
		<u>17 1/2</u>			
Total Hours: 136					
* 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 446 Modern Japan SP = HI 373 Colonial Latin America; HI 374 Modern Latin America			** Cadets are required to take a PO course appropriate to their foreign language area(s): AR = Any 300 level PO course FR and GR = PO 327 Politics and Western Europe JP = PO 345 Politics in East Asia SP = PO 342 Politics in Latin America or PO 327 Politics in Western Europe		

PHYSICS CURRICULUM

While engaged in the study of physics, one strives toward the goal of an understanding of the physical behavior of the universe and the basic laws of nature. In guiding cadets toward this goal, we hope to accomplish two objectives: that our graduates will have acquired the ability to think analytically and will have gained some experience in the method of experimental investigation of physical phenomena.

A physics major must take a number of mathematics courses in order to become equipped with the tools necessary for the application of physical principles. Laboratory work, essential in scientific education, is emphasized. At the same time, the curriculum includes a liberal distribution of study outside of physics and mathematics in order to ensure a well-rounded education.

The physics curriculum has been designed to provide flexibility and to avoid overspecialization in physics. Our graduates find themselves qualified for a variety of opportunities in both technical and non-technical fields.

Facilities of the Department of Physics and Astronomy include a nuclear physics laboratory which houses a low-energy particle accelerator, a thin film laboratory, a computer interfacing laboratory, an atomic force microscope, a laser-optics laboratory, an astronomy laboratory, faculty and cadet research areas, a well-equipped machine shop and two photolabs. Faculty members carry out research in a variety of areas including CCD photometry of variable stars (Cepheids), electronic imaging in astronomy, laser spectroscopy, organic/nanoparticles, thin films and thin film devices, and low-energy ion beam experiments using a Cockcroft-Walton particle accelerator. The department operates an astronomical observatory, featuring a research quality 20-inch telescope with spectrograph, photometer, and electronic camera. A 5-inch photographic refractor telescope was added several years ago.

The curriculum provides opportunities for frequent and close association among our physics majors and the faculty in the department. Study space is provided in Mallory Hall for all physics majors. The department sponsors a chapter of the Society of Physics Students as well as a chapter of Sigma Pi Sigma, the national physics honor society.

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 207, PY 208, PY 217, and PY 218
or PY 101, PY 108, PY 203
2. Modern Physics
PY 343 Modern Physics
3. At least 9 additional hours of courses are required. Those courses must be selected from the following: AT 306, PY 253, PY 254, PY 333, PY 334, PY 341, PY 342, PY 344, PY 441, PY 442, PY 444, PY 446, PY 450, PY 453, PY 457, 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 207-208 and PY 217-218 or PY 101, PY 108, PY 203
AT 201 - The Solar System
AT 204 - Stars, Galaxies, and the Universe
AT 301 - Observational Techniques
AT 306 - Introductory Astrophysics
PY 331W - Independent Project I

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

SYNOPSIS OF THE PHYSICS CURRICULUM

First Semester		Semester Hrs. Credit	Second Semester		Semester Hrs. Credit
Subject			Subject		
FOURTH (Freshman) CLASS					
CH 117	Lab for CH 137	1	CH 118	Lab for CH 138	1
CH 137	General Chemistry	3	CH 138	General Chemistry	3
EN 101	English Composition I	3	EN 102	English Composition II	3
HI 103	World History	3	HI 104	World History	3
MA 115	Calc. with An. Geom. I	3	MA 116	Calc. with An. Geom. II	3
PY 101	Intro. to Physics and Astronomy	2	PY 108	General Physics 1	4
PE 101	Swimming	1/2	PE 102	Boxing	1/2
	AS, MS, or NS	<u>1</u>		AS, MS, or NS	<u>1</u>
		16 1/2			18 1/2
THIRD (Sophomore) CLASS					
MA 215	Calc with An. Geom. III	4	MA 216	Calc. with An. Geom. IV	2
PY 203	General Physics 2	4	MA 311	Elem. Dif. Eq.	3
PY 223	Programming & Data Analysis	2	PY 238	Laboratory Techniques	1
PE 200	Drug and Alcohol Awareness	1/2	PY 253W	Optics Lab	1
	Elective	3	PY 254	Optics	3
	Elective	3		Elective	3
	AS, MS, or NS	<u>1</u>		Elective	3
		17 1/2	PE 211	Wrestling	1/2
				AS, MS, or NS	<u>1/2 NS</u>
					17 1/2-18 1/2
SECOND (Junior) CLASS					
MA 301	Higher Math Engr. Sc.	3	PY 332	Independent Project II	1
PY 331	Independent Project I	1	PY 342	Elec. & Mag. II	3
PY 341	Elec. & Mag. I	3	PY 441	Classical Mechanics I	3
PY 333W	Modern Physics Lab	1		Elective	3
PY 343	Modern Physics	3		Elective	4
PE 300	Prin. Physical Cond.	1/2		Physical Education	1/2
	Elective	3		AS, MS, or NS	<u>2</u>
	AS, MS, or NS	<u>2/1 NS</u>			16 1/2
		15 1/2-16 1/2			
FIRST (Senior) CLASS					
PY 457	Electronics and Interfacing	4	SE 300	Public Speaking	1
PY 446	Thermal Physics	3		Elective	3
PY 459	Intro. Quantum Mech.	3		Elective	3
PY 401	Senior Seminar	1		Elective	3
	Elective	3		Elective	1
	Elective	3		Physical Education	1/2
	Physical Education	1/2		AS, MS, or NS	<u>2</u>
	AS, MS, or NS	<u>2</u>			13 1/2
		19 1/2			
Physics Elective Courses Offered					
PY 334	Nuclear Physics Laboratory	1	PY 450	Advanced Laboratory	1
PY 344	Nuclear Physics	3	PY 453	Nuclear Reactor Engineering	3
PY 444	Condensed Matter Physics	3	PY 460	Quantum Mech. Topics	3
PY 447-448	Thesis	2-8	PY 442	Classical Mechanics II	3
PY 481-489	Special Topics	3	PY 291-294	Summer Research	1 to 4
			PY 391-394	Summer Research	1 to 4
			PY 491-494	Summer Research	1 to 4
Total Hours: 136 (includes 43 hours of physics courses)					

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 curricula require 135 or 136 hours to graduate (depending on the science courses taken), of which 33 must be in psychology. (Note: EN 101, EN 102, and MA 115 must be passed with a grade of C or better.)

MINOR IN LEADERSHIP STUDIES

See Special Programs, page 86.

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, PO 331, 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. Nine hours must be selected from PS 203, PS 204, PS 301, PS 302, PS 305, PS 307, PS 401, PS 402, or PS 404. The remaining six hours may be chosen from PS 303, PS 304, PS 306, PS 313, PS 403 or BI 216.

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

First Semester		Semester Hrs. Credit	Second Semester		Semester Hrs. Credit
Subject			Subject		
FOURTH (Freshman) CLASS					
CH 137	Intro. College Chem I	3	CH 138	Intro. College Chem. II	3
CH 117	Lab for CH 137	1	CH 128	Lab for CH 138	1
EN 101	English Composition I*	3	EN 102	English Composition II*	3
HI 103	World History	3	HI 104	World History	3
MA 115	Calc. with An. Geom. I*	3	MA 116	Calc. with An. Geom. II	3
	Foreign Language	3		Foreign Language	3
PE 101	Swimming	1/2	PE 102	Boxing	1/2
	AS, MS, or NS	1		AS, MS, or NS	1
		<u>17 1/2</u>			<u>17 1/2</u>
THIRD (Sophomore) CLASS					
PH 201	Greek/Med Phil.	3	PH 202	Modern Philosophy	3
PS 201	Intro. to Psychology	3	PS 204	Biopsychology II	3
PS 203	Biopsychology I	3	MA 118	Finite Math	3
	Foreign Language	3		Foreign Language	3
	Elective (free)	3		Elective (free)	3
PE 200	Drug and Alcohol Awareness	1/2	PE 211	Wrestling	1/2
	AS, MS, or NS	1		AS, MS, or NS	1/2 NS
		<u>16 1/2</u>			<u>16 1/2-17 1/2</u>
SECOND (Junior) CLASS					
MA 326	Probability and Statistics	3	MA 405	Statistics	3
PS 302	Social Psychology	3	PS 301	Psychology of Learning	3
PS 307	Developmental Psychology	3		Elective (science)	4
	Elective (free)	3		Elective (free)	3
	Elective (science)	4		Elective (free)	3
PE 300	Principles of Phys. Cond.	1/2		Physical Education	1/2
	AS, MS, or NS	2/1 NS		AS, MS, or NS	2
		<u>17 1/2-18 1/2</u>			<u>18 1/2</u>
FIRST (Senior) CLASS					
PS 305	Abnormal Psychology	3	PS 403	Independent Project	3
PS 401	Cognition	3	PS 404	History & Systems	3
PS 402	Research Methods	3		Elective (free)	3
	Elective (free)	3		Elective (free)	3
	Physical Education	1/2	SE 300	Public Speaking	1
	AS, MS, or NS	2		Physical Education	1/2
		<u>14 1/2</u>		AS, MS, or NS	2
					<u>15 1/2</u>
<p>*Requires grade of C or higher.</p>					
<p>Total Hours: 135 (includes 33 hours of psychology courses)</p>					

SYNOPSIS OF THE B.A. CURRICULUM IN PSYCHOLOGY

First Semester		Semester Hrs. Credit	Second Semester		Semester Hrs. Credit
Subject			Subject		
FOURTH (Freshman) CLASS					
CH 131	Chem. Science I	3	CH 132	Chem. Science II	3
CH 111	Lab for CH 131	1	CH 112	Lab for CH 132	1
EN 101	English Composition I*	3	EN 102	English Composition II*	3
HI 103	World History	3	HI 104	World History	3
MA 105	Intro. Prob. and Stat. I	3	MA 106	Intro. Prob. and Stat. II	3
	Foreign Language	3		Foreign Language	3
PE 101	Swimming	1/2	PE 102	Boxing	1/2
	AS, MS, or NS	1		AS, MS, or NS	1
		<u>17 1/2</u>			<u>17 1/2</u>
THIRD (Sophomore) CLASS					
PH 201	Greek and Medieval Philosophy	3	PH 202	Modern Philosophy	3
PS 201	Intro. to Psychology	3	MA 107	Stat. for Social Sciences	3
PS 203	Biopsychology I	3	PS 204	Biopsychology II	3
	Foreign Language	3		Foreign Language	3
	Elective (free)	3		Elective (free)	3
PE 200	Drug and Alcohol Awareness	1/2	PE 211	Wrestling	1/2
	AS, MS, or NS	1		AS, MS, or NS	1/2 NS
		<u>16 1/2</u>			<u>16 1/2-17 1/2</u>
SECOND (Junior) CLASS					
PS 305	Abnormal Psychology	3	PS 301	Psychology of Learning	3
PS 307	Developmental Psychology	3	PS 302	Social Psychology	3
	Elective (free)	3		Elective (free)	3
	Elective (Science)	3-4		Elective (Science)	3-4
	EN Elective OR			EN Elective OR	3
	Foreign Language (300 Level)	3		Foreign Language (300 Level)	
PE 300	Prin. of Physical Cond.	1/2		Physical Education	1/2
	AS, MS, or NS	2/1 NS		AS, MS, or NS	2
		<u>16 1/2-18 1/2</u>			<u>17 1/2-18 1/2</u>
FIRST (Senior) CLASS					
PS 401	Cognition	3	PS 403	Independent Project	3
PS 402	Research Methods	3	PS 404	History and Systems	3
	Electives (free)	9		Electives (free)	6
	Physical Education	1/2	SE 300	Public Speaking	1
	AS, MS, or NS	2		Physical Education	1/2
		<u>17 1/2</u>		AS, MS, or NS	2
					<u>15 1/2</u>
<p>*Requires grade of C or higher in the course.</p>					
<p>Total Hours: 136-138 (includes 33 hours of psychology courses)</p>					

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 303 (Organizational Behavior and Leadership) 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.

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

Economics/Business

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

English

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

Environmental Leadership

EL 201 Intro. to Environmental Leadership

History

HI 352 American Military History
HI 458 Great Commanders
HI 467 Evolution of Strategy

Physical Education

PE 330 Health Education

Politics

PO 331 Political Theory
PO 333 National Security Policy
PO 407 Public Sector Policy
PO 434 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.

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 Procedures:

Cadets wishing to apply for the program must submit an application to the Director of Teacher Certification, LTC Lenna Ojure, in 215 Carroll 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 course 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 must 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

TEACHING TRAINING

A cadet who wishes to teach in a high school after graduation, should contact the Board of Education in the state where he/she wishes to teach as soon as the decision is made. Most states will issue a temporary certificate to a college graduate with the provision that he enroll in education courses during the summer, but the cadet should find out the specific requirements of the state(s) which interest him/her.

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
JP —	Japanese
LS —	Leadership Studies
MA —	Mathematics
ME —	Mechanical Engineering
MS —	Military Science
MU —	Music
NS —	Naval Science
PE —	Physical Education
PH —	Philosophy
PO —	Political Science
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 Tubbs (Head); Majors Danas, Maraj, and Marsh; Captains Galloway and Emanuel; Lieutenants Archer and Honaker.

AS 103 and AS 104. THE AIR FORCE TODAY 1.5—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 1.5—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 214. AIR FORCE LAB FOR AS 204 0—1—0

Prepares cadets pursuing an Air Force commission for Field training summer camp.

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.

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 FORCES IN CONTEMPORARY AMERICAN SOCIETY 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 107.)

ASTRONOMY

(Under Administrative Supervision of Department of Physics and Astronomy) Colonel DuPuy. See page 112.

BIOCHEMISTRY

BC/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). Pre: BI 101, CH 224/225 (Organic)

BC/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.

BC 323. (CH 323) INTRO. BIOCHEMISTRY LABORATORY 0—3—1 1/2 See description in Chemistry offerings.

BC 400. SEMINAR IN CMCBC 2—0—1

A general seminar course where in three to four speakers will visit throughout the semester. During class periods preceding the seminar, students will be introduced to the research area and problem by reading and discussing journal articles from current literature related to the topic, including papers authored by the speaker. During the speaker's visit, along with delivering his or her seminar, he or she will meet and speak personally with the students in the classroom setting, offering a more relaxed opportunity for the students to discuss the topic with the speaker. In class periods following the seminar, the students will discuss the presentation in terms of scientific merit. Students will then be required to submit a paper reviewing the scientific material presented and critiquing the presentation. The end of the course will consist of capstone presentations by students in areas of their choice surrounding one of the topics presented by the speakers. Pre: BI 101, CH 138

BC 410. "ADVANCED TOPICS" IN BIOLOGICAL CHEMISTRY 3—0—3

This course will involve the pursuit of a topic relevant to molecular, cellular and biological chemistry and will be investigated to a great degree of depth. The chemistry and biology of a specific physiologic process or disease state will be presented, emphasizing how chemical principles and analytical techniques aid in understanding the biological chemistry of the event. The first two quarters of the semester will be devoted to discussing the molecular and biochemical mechanisms and regulation of the process, as well as similar, related processes. The third quarter of the course will be devoted to the investigation and discussion of normal physiological processes. The last quarter of the course will cover numerous disease processes related to the abnormal physiology of the topic. Strategies to control or alter the process will be discussed as potential therapeutic interventions for various disease states. Pre: BI 101, CH 224/225 (Organic)

BC/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)

DEPARTMENT OF BIOLOGY

Colonels Rowe (Head) and Baur; Lieutenant Colonel Bell; and Majors Humston and Stands.

Requirements for major in biology are specified on page 42.

BI 101. GENERAL BIOLOGY I 3—3—4

BI 102. GENERAL BIOLOGY II 3—3—4

A comparative study of the morphology, physiology and taxonomy of animals and plants beginning with the biochemistry and molecular biology of cells. Included also are basic genetics, evolution and ecology. Cadets in other majors may take either course for credit.

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 nonparametrics.

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.

BI 220. CURRENT ISSUES IN BIOLOGY (W) 3—0—3

This course involves an examination of current noteworthy issues in biology. Topics selected may range from the implications of the Human Genome Project to the effects of deforestation of the tropical rain forests. Students will give presentations, write summaries of class discussions, and write several longer papers. This course is open to all students.

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 302. 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 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 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 or BI 311.

BI 318. PLANT MORPHOLOGY 3—3—4

Considerations of the structure and functions of plant cell types, tissues, and the morphology of organs in non-vascular and vascular plants. Prerequisite BI 101 and 102 or BI 217.

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 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 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 353 and BI 354. SUMMER SCHOLARS PROGRAM 0—8—4 to 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 392 and BI 393. 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—6

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 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. ORGANIC EVOLUTION 2—0—2

An introduction to the principles and modern theories of evolutionary processes. The course covers biochemical evolution and the origin of life, examines the evidences upon which the concept of organic evolution is based, critically reviews the mechanisms of speciation and geographical isolation, and assesses the role of Darwin and his contemporaries in the formulation of the Darwinian theory. 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 413. 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 420. 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.

BI 490 and BI 491. 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 Schreiber (Head), Jones, Ludt, Pharr, Riethmiller, and Turner; Majors Cain, Smith, Stands and Timmons; Drs. Coker, Hinks, and Van Kuiken; Mrs. Smith and Mrs. Wingfield; Mr. Christiansen.

Requirements for a major in chemistry are specified on page 46.

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—3—11/2

Basic laboratory experiments, including an introduction to the use of some laboratory instruments. Corequisite: CH 137, for CH majors only*.

CH 126. LABORATORY FOR CH 138* 0—3—11/2

A continuation of CH 125, including six weeks of qualitative analysis of metal ions. 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 150. INTRODUCTORY BIOCHEMISTRY 2—2—3

Introduction to chemistry as it relates to biological systems. Topics introduced will include chemical pathways in metabolism, the chemistry of enzymology, and biotechnology. Laboratories will emphasize modern biochemical techniques. Corequisites: CH 138 and 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.

CH 225. ORGANIC LABORATORY I 0—3—1 1/2

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 1/2

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 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 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 311. LABORATORY FOR CH 301 0—3—1 1/2

CH 312. LABORATORY FOR CH 302 0—3—1 1/2

Laboratory exercises which illustrate physical chemistry principles and laboratory techniques. Corequisites: CH 301 for CH 311 and CH 302 for CH 312.

CH 315. ANALYTICAL CHEMISTRY I 3—3—4 1/2

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. Emphasis upon real samples and development of analytical laboratory techniques.

CH/BC 321. STRUCTURAL BIOCHEMISTRY 3—0—3

See Biochemistry offerings.

CH/BC 322. METABOLIC BIOCHEMISTRY 3—0—3

See Biochemistry offerings.

CH 316. ANALYTICAL CHEMISTRY II 3—3—4 1/2

A continuation of CH 315 with emphasis on more advanced techniques of chemical analysis. Laboratory work involves gas chromatography, high pressure liquid chromatography, spectroscopy to include Fourier transfer infrared, nuclear magnetic resonance, fluorescence, atomic absorption and ultraviolet/visible. Gas chromatography/mass spectrometry is also covered in the course. Prerequisites: CH 301 and CH 315. Corequisite: CH 302 and CH 312 or permission of instructor.

CH 323. LABORATORY FOR CH 321 0—3—1 1/2

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: BI 101; Corequisite: CH 321.

CH 351. AUTOMATION OF LABORATORY MEASUREMENTS 2—3—3

Introduction of concepts involved in interfacing laboratory experiments to minicomputers and application of these concepts to practical problems. Topics would include fundamentals of digital logic, analog-to-digital and digital-to-analog conversions, basic computer architecture and input/output signals, timing and control applications. The laboratory includes operation of basic interfacing elements, minicomputers and microprocessors, construction of simple interfaces, and applications to instrumentation. Open to first and second classmen in science and engineering curricula.

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 advisor.

CH 359. RESEARCH TOPICS IN CHEMISTRY 0—4—2
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 396. CHEMISTRY IN HISTORICAL CONTEXT 3—0—3

A course designed to acquaint the student with the historical and cultural context surrounding some of the major 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 medieval times to the present. The students will be required to write reports on a variety of chemical topics after having read classic texts and papers from the applicable period. Students will also prepare some chemical compounds of historical interest: gunpowder, urea, alcohol, soap, aspirin and nylon. Prerequisite: two semesters of general chemistry.

CH 423. QUALITATIVE ORGANIC ANALYSIS 2—4—4

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, nmr spectroscopy) of analysis is discussed, and problems on structure determination supplement the laboratory work. Prerequisites: CH 223, CH 224, CH 301, and CH 302.

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 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

Colonels Buckner (Head), Hoadley, Mullen, Page Rogers, and Schneider; Captains Erchul and Riester; Major Bott; Doctor Maisano.

Requirements for a major in civil engineering are specified on page 50.

CE 101. INTRODUCTION TO CIVIL ENGINEERING I 1—2—2

Introduction to the civil engineering profession and the responsibilities of engineers in a technical society. Elementary electronic spreadsheet operations.

CE 102. INTRODUCTION TO CIVIL ENGINEERING II 0—2—1

Advanced electronic spreadsheet operations. Prerequisite: CE 101 or permission of instructor.

CE 202. SURVEYING 2—3—3

Surveying instruments, measurements of horizontal and vertical distances and direction, traverse computations, topographic mapping, and construction surveys. Prerequisite: ME 102.

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 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 116 and ME 201.

CE 301. STRUCTURAL THEORY 3—0—3

Analysis of statically determinate and indeterminate structures. Application of electronic computer to structural analysis. Prerequisites: CE 206, and MA 201.

CE 304. CIVIL ENGINEERING METHODS 3—0—3

The course addresses the application of numerical methods and basic mathematical modeling to civil engineering problems. Methods will include such topics as root finding, solutions to linear equations, matrix manipulations, numerical integration and differentiation, error analysis, applied probability, optimization, and parametric modeling. Example applications in civil engineering are presented to illustrate each topic. Methods are spreadsheet based. Prerequisite: CE 102, CE 206 or permission of instructor.

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: 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: MA 116 and ME 201.

CE 310. SOIL MECHANICS 2—3—3

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: CE 206.

CE 319. WATER RESOURCES LABORATORY 0—3—1

Laboratory experiments and statistical analysis of hydrological and hydraulic processes; analysis and design of water distribution systems. Prerequisites: CE 309 and CE 321. Corequisite: CE 322.

CE 321. ENVIRONMENTAL ENGINEERING 3—0—3

Environmental aspects of pollution control emphasizing water and wastewater treatment, with a review of waste/water characteristics, environmental regulations, risk assessment, solid waste management, groundwater contamination, and air quality.

CE 322. WATER RESOURCES ENGINEERING 3—0—3

Introduction to the hydrologic cycle, runoff calculations, groundwater flow, water resources management, open channel flow, culvert design, and hydraulic structures. Prerequisite: CE 309. Corequisite and CE 319.

CE 327. REINFORCED CONCRETE DESIGN 3—0—3

Design of reinforced concrete members by ultimate strength methods. Applications of the electronic computer. Prerequisite: CE 301 and MA 311.

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

Project delivery methods; general conditions of a construction contract; CPM and PERT scheduling; time-cost tradeoff and resource leveling; computer-aided management of projects; economic analysis of engineering and construction projects including present worth, benefit-cost, depreciation, cash flows, and replacement strategies.

CE 401. HYDROLOGY 3—0—3

Occurrence and movement of surface and ground water; precipitation, evaporation, and runoff; infiltration and ground water flow; hydrograph analysis; simulation and design of hydrologic systems. 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 406. PRINCIPLES OF CONTAMINANT HYDROGEOLOGY 3—0—3

Occurrence and movement of groundwater in porous and fractured soils, and the transport and fate of contaminants released to these soils. Applications of groundwater flow and contaminant transport models using personal computers. Prerequisites: CE 309 and CE 310.

CE 408. HYDRAULIC ENGINEERING 3—0—3

Analysis of hydraulic 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 and application of physical and chemical processes for air pollution control. 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 will be studied. Applications of the microcomputer. 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 develop highway designs using the electronic 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.

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 54.

CS 111. INTRODUCTION TO COMPUTER SCIENCE 3—1—4

The course provides a comprehensive and rigorous introduction to the dynamic and diverse field of computer science for both computer science majors and non-majors interested in computer science fundamentals. Includes units on the history of computing and societal and ethical issues as well as a technical overview of computing systems.

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. Prerequisite: C or better in CS 111.

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. 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

Logic, Sets, Functions, Algorithms, Number Systems and Representations, Matrices, Mathematical Reasoning and Proof, Permutations, Combinations, Probability. Prerequisite: C or better in CS 111, or CS 340 or equivalent.

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, microprogramming; peripheral devices; interfacing and subroutines. 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 222.

CS 327. NETWORK COMPUTING 3—0—3
 An intermediate level course discussing the background and history of networking and the Internet, Network standards, OSI 7-layer model, TCP/IP, Web technologies, and Network security. Prerequisite: C or better in CS 122.

CS 340. C PROGRAMMING 3—0—3
 UNIX interface, reusable code, libraries, dynamic memory allocation, stacks, queues, trees, search, and graphs.

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. 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 222.

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, security and protection, and file systems. 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: Permission of the instructor.

CS 430. ARTIFICIAL INTELLIGENCE 3—0—3
 Turing's test for intelligence; the language LISP; productions and matching; knowledge representation; search; learning. 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 490 W. 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.

DEPARTMENT OF ECONOMICS AND BUSINESS

Brigadier General Badgett; Colonels Bush, Duncan (Head), Fraley, Husted, and West; Lieutenant Colonels Basu, Gutermuth and Moreschi; and Majors Cobb and Sen.

Requirements for a major in economics and business are specified on page 56.
 *For all economics and business majors, the following courses must be completed with a grade of C or higher: MA 118, 121; EN 101, 102; EC 201, 202, 203, 300, 304, 330; BU 210, 211, 216, 220, 310, 312, 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
 Study of economic analysis, institutions, and policies of contemporary mixed economies, including examination of the pricing system in relation to the functions of production, distribution, consumption, and exchange.

EC 202. *PRINCIPLES OF MACROECONOMICS 3—0—3
 Study of economic analysis, institutions, and policies of contemporary mixed economies, including examination of the stability and growth of national income and its key variables.

EC 203. *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 118 and MA 121 with grade of C or higher.

EC 300. *INTERMEDIATE MICROECONOMICS 3—0—3
 Analysis of the determination of price and output in commodity and factor markets under varying competitive 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 MA121 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 203 with grade of C or higher.

EC 306. INTERNATIONAL ECONOMICS 3—0—3

The theory of international trade and finance and its application to current economic problems. Prerequisites: EC 201-202.

EC 307. INTERNATIONAL FINANCE 3—0—3

A study of the macroeconomic issues of international economics. It investigates how a nation's monetary and fiscal policies are affected by the openness of the economy. To accomplish this, the theory of foreign exchange markets, exchange rate policies and open economy macroeconomic models will be developed. In addition, policies and institutions in the "real world" that monitor trade between nations will be discussed, including analyses of how these affect the macro well being of the global economy. This includes an analysis of exchange rate policies in the post-World War II Era, the International Monetary Fund, the World Bank, Direct Foreign Investment and the Debt Crisis of the Developing World. Prerequisites: EC 201 and 202 with a C or better or Permission of Department Head.

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 which 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 121 with grade of C or higher.

EC 401. DEVELOPMENTAL ECONOMICS 3—0—3

A study of leading growth theories with special application to less developed countries. Emphasis is placed on the processes which lead to economic growth and the interaction between developed and less developed countries. Special topics will include the role of human capital formation, population growth, the international debt crisis, balance-of-payments issues, and others. 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 with a grade of C or higher.

EC 404. COMPARATIVE ECONOMIC SYSTEMS 3—0—3

The economic principles, problems, and accomplishments of capitalism, socialism, and communism. 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 with grade of C or higher.

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.

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 with grade of C or higher.

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 department head.

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 Department Head. Syllabus: available on the web at http://academics.vmi.edu/Econ_ab/new_page_1.htm.

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) with permission of Department Head.

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—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.

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 118 OR a grade of C or better in both MA 105 and MA 106.

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.

BU 216. 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 220.* PRINCIPLES OF MANAGEMENT 3—0—3

The principles and techniques of business management, with emphasis on the processes of management in the private sector of the economy. Analysis of the managerial functions of planning, organizing, directing, and controlling.

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. Current needs and sources of funds, capital budgeting, cost of capital, and the decision-making process are the four areas emphasized. Prerequisite: BU 210.

BU 312.* PRINCIPLES OF MARKETING 3—0—3

Analysis of the marketing function in business enterprise, including product development, pricing, distribution, and promotion. Includes study of market research and analysis techniques.

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 312.

BU 322. HUMAN RESOURCE MANAGEMENT 3—0—3

The knowledge, skills, and abilities of management and nonmanagement 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 203 with a grade of C or higher.

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.

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, market efficiency, and capital market theory. Prerequisites: EC 201-202, and BU 310 with a grade of C or higher.

BU 412. PORTFOLIO MANAGEMENT 3—0—3

A practical and theoretical examination of investment management techniques. 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 411 or concurrent enrollment.

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.

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 strategy and policies, concepts, and practices. Production and pricing from the perspective of the marketing manager. Prerequisite: BU 312 with grade of C or higher.

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 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 203, EC 300, BU 210, BU 220, BU 230. Corequisite: BU 310.

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.

*For all economics and business majors, the following courses must be completed with a grade of C or higher: MA 118, 121; EN 101, 102; EC 201, 202, 203, 300, 304, 330; BU 210, 220, 230, 310, 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 86.

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—0—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 PRATICUM 4—0—4

Those students seeking licensure to teach at the secondary level take this course to learn the methods and materials design appropriate to secondary teaching. Through the course, students demonstrate their knowledge and skills in the following areas: setting goals and objectives; unit and lesson planning; varying teaching techniques; classroom management; building reading and study skills in the content areas; individualized 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. Students will complete reading and projects germane to their specific endorsement area. 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), Barr, Livingston, and Smith; Lieutenant Colonel Squire; Major Dale; and Mr. Herwald.

Requirements for a major in electrical engineering are specified on page 58.

EE 101 INTRO TO ELECTRICAL AND COMPUTER ENGINEERING 1—1—1

This course develops problem solving and computer software skills useful in electrical and computer engineering. Cadets will become familiar with basic electrical and computer engineering equipment and measurement procedures. Cadets will also have the opportunity to work as part of an engineering design team to achieve project goals. Features of the electrical and computer engineering discipline, including fields of study, professional registration, and ethics will also be addressed.

EE 104 COMPUTER TOOLS IN ELECTRICAL ENGINEERING 1—2—2

Introduces and augments the use of the personal computer and software applications as they apply to electrical engineering. Emphasizes the use of applications running under the Windows operating system. Applications may include spreadsheets, MATLAB, and PSPICE for problem solving, data analysis, simulation, and documentation. Also provides a short introduction to fundamental programming structures.

EE 222. ELECTRICAL CIRCUIT ANALYSIS I 3—0—3

Analysis of DC resistive circuits with dependent and independent current and voltage sources. Node voltage, mesh current analysis methods, Thevenin and Norton equivalents, superposition, maximum power transfer. Ideal operational amplifier circuit analysis. Prerequisites: MA 116 and EE 101 (or permission of the instructor). EE majors must complete this course with a grade of C or higher.

EE 223. ELECTRICAL CIRCUIT ANALYSIS II 3—2—4

Analysis of AC circuits incorporating resistors, capacitors, and inductors. Transient analysis using differential equations. Steady state analysis using phasors. Single and three-phase AC power. The laboratory portion of this course will cover DC and AC circuits designed to illustrate basic laws and demonstrate relevant design principals. Prerequisites: a C or better in EE222, MA 311.

EE 229. INTRODUCTION TO DIGITAL CIRCUITS 3—2—4

This course serves as an introduction to the fundamentals of digital logic design, including number systems, Boolean algebra, basic logic gates and simplification techniques. Design and analysis techniques are taught for combinational logic circuits, and synchronous and asynchronous sequential logic circuits. The use of VHDL is introduced for digital circuit modeling and implementation on simple programmable logic devices. Lab experiments are closely integrated with theory to provide experience with digital hardware design.

EE 321. SYSTEMS DESIGN I 3—0—3

EE 321 gives an overview of project management to include aspects of team building, systems engineering, engineering economics, design, testing, safety, legal and ethical implications. The systems engineering process is described in terms of: 1) Requirements Analysis, 2) Functional Analysis and Allocation, 3) Design Synthesis, and 4) Design and Test and Evaluation Feedback loops of the process. Project life cycles are discussed in terms of four phases: 1) concept exploration, 2) system development and demonstration, 3) system production and deployment, and 4) system sustainment. A Work Breakdown Structure is used to organize and identify the product and process components of a project that is realized in the second semester of this course.

EE 325. ELECTROMAGNETIC FIELDS 3—0—3

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 in vacuum and material bodies: Ampere's, Biot-Savart's and Faraday's laws, Stoke's theorem, Time dependent fields, Maxwell's equations. Prerequisites: MA 215 and PY 208.

EE 326 ENERGY CONVERSION 3—2—4

Introduction to electromechanical energy conversion, magnetic circuits and materials, inductance, mechanical force, torque, and power, transformers, A.C. and D.C. machines. The laboratory portion will cover power measurements, power factor, hysteresis effects, transformer equivalent circuits, A.C. and D.C. motors and generators. Prerequisites: MA 116 and EE 223.

EE 328. DIGITAL SYSTEMS AND COMPUTER DESIGN 3—2—4

This course presents techniques for designing complex digital systems including elementary von Neumann computer architectures. Topics covered include medium and large scale logic functionality, top-down design, the partitioning of controller and data architectures, the use of controller design techniques such as ASM charts and microprogramming, and an introduction to basic computer architecture. Design methods will be demonstrated using real-world examples. Practical considerations such as the use of synchronizers, clock skew, and worst-case timing analysis will also be covered. The laboratory will focus on the use of computer tools such as VHDL for modeling digital systems. Prerequisite: EE 229.

EE 330. SIGNAL AND SYSTEM ANALYSIS 3—0—3

Emphasis on continuous linear systems; time domain analysis, convolution, Laplace transform, Fourier series, Fourier integral. Introduction to discrete systems, sampling, filters. Use of MATLAB will support this course. Prerequisite: EE 223.

EE 339. MICROCONTROLLERS 3—2—4

Fundamentals of microprocessors and microcontrollers and their use in the design of embedded systems. Includes basic architectures, memory and input/output interfacing, interrupt-driven processing, and assembly language programming. May include the use of high-level languages in embedded system design. Laboratory exercises include the use of a microcontroller for controlling a mobile robot. Prerequisite: EE 328 or permission of 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 116 and PY 208. 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 355. ELECTRONICS I 3—2—4

Topics include: Semiconductors, diodes, bipolar junction transistors, 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 356. ELECTRONICS II 3—2—4

Topics include: Frequency response of small-signal BJT and FET amplifier circuits, cascaded amplifiers, operational amplifiers, feedback, stability and microelectronic fabrication. Analysis and design techniques using PSPICE will be emphasized. The laboratory portion of this course will involve the design and construction of solid state electronic circuits. Experiments include wide-band amplifier design, cascaded amplifier circuits and operational amplifier applications. Prerequisite: EE 355.

EE 406. MICROCONTROLLERS II 2—2—3

Microcomputer operation in the PC environment. Intel microprocessor family architecture, interfacing and programming. Prerequisite: EE 339.

EE 413. MICROELECTRONICS 2—2—3

This course emphasizes microelectronic circuit design and fabrication, including thick film technology, thin film technology, multichip module technologies, surface mount technology, and printed circuit board technology. In the laboratory, students will perform computer-aided design, photo-reduction, screen printing, component attachment, and printed circuit board construction, in the development of several microelectronic circuits. Prerequisite: EE 356.

EE 422. SENIOR DESIGN II 2—3—3

EE 422 provides an introduction to and overview of the elements and methodology of Engineering System Design. A specific engineering system design problem is assigned to the class, which is subdivided into teams. The teams, working independently, apply a system engineering approach to the design problem giving consideration to realistic constraints including technological, economic, social-political, environmental, ethical, legal, and

safety. The teams will identify the different aspects of the overall system design and assign individual team members responsibilities for components, subsystems or other specific aspects of the design. The team will integrate the contributions of the individual team members into a coherent design that provides an acceptable solution to the systems design problem while at the same time demonstrating an understanding of the application of engineering systems design methodology. Each team will present their design in a detailed written and oral presentation at the end of the semester.

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

Introduction to the fundamentals of discrete-time signals and systems including the representation of discrete-time and digital signals, analysis of linear discrete-time signals, frequency response, Fourier transform, Z transform, and sampled data systems. The design and analysis of digital filters is examined by reviewing analog filter design methodologies. The laboratory will emphasize practical considerations involved with the design and implementation of DSP algorithms. Prerequisite: EE 330 or permission of instructor.

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: EE 229 Introduction to Digital circuits.

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. Corequisite: EE 472.

EE 470. SEMINAR 0—1—1/2

EE 471 SEMINAR 0—1—1/2

Weekly seminars. Topics covered include outside speakers (technical and non-technical), placement service, graduate school information, preparation of resumes, information concerning the Fundamentals of Engineering examination, IEEE Student Branch meetings, and other relevant matters.

EE 472. 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 330 and EE 356.

EE 481. AUTOMATIC CONTROL SYSTEMS 3—2—4

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: MA 311 and EE 330.

EE 482. DIGITAL CONTROL SYSTEMS II 3—0—3

Sampling processes and theorems, z-transforms, transfer functions and stability criteria. Analysis in the frequency and time domains. Discrete state models of systems containing digital computers. Design of compensation discrete filters. Introduction to nonlinear and time varying systems and optimal control theory. Prerequisite: EE 481.

EE 486. MICROWAVE THEORY AND TECHNIQUES 2—2—3

Microwave signal transmission through space, transmission lines and waveguides. Measurement methods. Practical applications. Prerequisites: EE 325, EE 356, or permission of the instructor.

EE 488. ELECTRO-OPTICS 3—0—3

Lightwave science and optical information processing. Dielectric waveguides, optical transmitters, receivers and multiplexers. Prerequisite or corequisite: EE 325.

EE 491. INDEPENDENT RESEARCH 1—0—1

EE 492. INDEPENDENT RESEARCH 0—4—2

Students are required to select a research project or advanced study of some subject in electrical engineering with the approval of the professor, who will serve as advisor, and the head of the department. Work will be supervised by the professor who will determine how credit is to be established, whether by formal examination or submission of a final report. In any case, the student will give a final oral report to the faculty and other interested cadets. Prerequisites: approval of department head and instructor.

DEPARTMENT OF ENGLISH AND FINE ARTS

Colonels Badgett, Ball, Baragona, Bedell, Leland, C. McDonald, R. McDonald, and Miller (Head); Lieutenant Colonels Ayau, Rachels, and Thompson; Major Ticen; Dr. Bedell; Lieutenant Commander Hart; Dr. Crowley, Mr. Ayres; Ms. Coleman; and Mrs. McCombs.

Requirements for a major in English are specified on page 62.

Note: A minimum grade of C in EN 101 is a prerequisite for EN 102, and a minimum grade of C in EN 102 is a prerequisite for all 200- and 300-level English 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 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.

EN 102. ENGLISH COMPOSITION II 3—0—3

This course reinforces students' understanding of the writing process, enhances their ability to develop a defensible argumentative thesis, and develops their ability to use research to inform and advance an argument. Minimum grade of C required. Prerequisite: Minimum grade of C in EN 101.

EN 200. READING LITERATURE 3—0—3

A study of prose, poetry, and drama from a variety of cultures. See the course schedule for specific information.

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 will consider the major writers and works of the intervening one thousand years. Writers will include Chaucer, Shakespeare, and Milton. Emphasis will be placed not only on individual works but also on continuity and tradition in the evolution of British literature.

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

Beginning with Romanticism and its exploration of the new relationship of human beings and nature as well as idealism and experience, this course will focus first on the works of Blake, Wordsworth, Coleridge, Byron, Shelley, and Keats. Then 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, it 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 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 METHODS OF LITERARY RESEARCH 3—0—3

This course is an introduction to literary research and writing. It will teach students how to conceive and shape topics that will involve research in a variety of areas, including historical, cultural, and biographical context, interpretive controversies, and textual issues. It will also offer instruction in the use of a wide range of research tools, both in print and online, from the general (e.g., the MLA Biography) to the highly specialized (e.g., concordances and facsimiles).

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 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.

EN 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.

EN 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.

EN 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.

EN 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 resumé preparation, but the course also offers students a chance to tailor assignments to their specific writing needs and interests.

EN 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).

EN 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.

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

This course is a study of the two most significant currents in American literature from the Civil War through the First World War: Realism and Naturalism. It will consider how both Realist and Naturalist writers responded to the economic, social, and scientific theories and realities of their times. Readings will include works by such authors as William Dean Howells, Mark Twain, Henry James, Charles Chesnut, Edith Wharton, 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 363 AMERICAN PERIOD — CONTEMPORARY 3—0—3

American Literature since World War II with particular emphasis on current authors such as Delillo, Ford, Powers, and Pynchon. Some topics addressed could include the sixties, the punks, minimalism, and postmodernism.

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 374. CLASSICS IN TRANSLATION 3—0—3

Introduction to leading ideas and literary forms in the ancient and medieval cultural traditions of western society. Major writers from Homer to Dante.

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. APPLIED LITERARY THEORY 3—0—3

An examination of the many ways of reading and interpreting literature. Readings may be historically arranged, from antiquity to the present, as the class examines both the critical tradition and the current debate over valid approaches to literature. Students will try out several different critical approaches in essays, often on literature of their choice. Prerequisite: one 200- or 300-level English course.

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 454. BEAT GENERATION LITERATURE 3—0—3
Intensive readings in several of the American authors (primarily Kerouac, Ginsberg, Burroughs, Corso, and Snyder) active from the mid- and late forties through the present, loosely grouped as the Beat Generation. What has shaped their philosophies? What are their themes? Styles? What have they contributed to American (and world) life and letters? This course will lay foundations from which to address such questions. 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 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.

EN 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: EN 340, 342, 345, or 347, agreement of the faculty sponsor; and permission of department head.

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 EN 102; permission of the department head. Limit: two independent reading courses in English.

EN 495. INDEPENDENT READING FOR HONORS 3—0—3
Open only to English Honors candidates, this course is devoted to reading in preparation for written and oral departmental honors examinations. Prerequisites: EN 201, 202 and 209; a 3.2 average in English courses beyond EN 102; 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.

ENGLISH-SECOND LANGUAGE

(See Department of Modern Languages, (ES) page 78.)

ENVIRONMENTAL LEADERSHIP

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

EL 201. INTRODUCTION TO ENVIRONMENTAL LEADERSHIP 3—0—3
Recognition of problems created by society's disruption of the environment. Sustainable development. Environmental literacy. Principles of leadership and management as applied to environmental concerns. Environmental regulations, policy making, and negotiations.

EL 402. ENVIRONMENTAL MANAGEMENT SEMINAR 3—0—3
Case studies and seminars on environmental crisis management. Environmental assessments and audits. Community conservation and pollution prevention techniques. Responsible care ethics.

FINE ARTS

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

Colonels Badgett and Ball.

Note: A minimum grade of C in EN 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 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.

FRENCH

See Department of Modern Languages, page 108.

GEOLOGY

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

GE 201. PHYSICAL GEOLOGY 3—0—3

The physical features and materials of the earth, including the internal and external processes by which they are formed. Fall semester.

GE 202. HISTORICAL GEOLOGY 3—0—3

The history of the earth from its birth to the dawn of recent time, including the orderly evolution of life from simple beginnings to the complex forms of today. Prerequisite: Either GE 201, GE 306, or permission of the instructor. Spring semester.

GE 204. ENVIRONMENTAL GEOLOGY 3—0—3

The analysis of natural and cultural environmental relationships and their economic and geopolitical implications; conservation and pollution prevention techniques. Prerequisite: Either GE 201, GE 306, or permission of the instructor. Spring semester.

GE 211. FIELD INVESTIGATIONS IN THE GEOSCIENCES 0—3—1

Focuses on direct observation of geologic process and recognition of geologic change. Field problems concentrate on the relationships of geologic settings and their links to geologic concepts, mapping, and instrumentation. Corequisite: GE 201. Fall semester.

GE 212. FIELD INVESTIGATIONS IN THE GEOSCIENCES 0—3—1

Focuses on direct observation of geologic process and recognition of geologic change. Field problems concentrate on the relationships of geologic settings and their links to geologic concepts. Corequisite: Either GE 202 or GE 204. Spring semester.

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 109.

DEPARTMENT OF HISTORY

Captain Turner (Head); Colonels Davis, Koeniger, Koons, McCleskey, Sheldon, Tucker, Vandervort, and Wilkinson; Majors Andreeva and Dowling; Drs. Harmon and Muir; Mr. Coffey.

Requirements for a major in history are specified on page 64.

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 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.

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 307. ENGLISH HISTORY I 3—0—3

A study of English history from Stonehenge to the Glorious Revolution in 1688. The focus is on social, cultural, and constitutional history, as they illuminate political trends. Required of English majors and open to others as an elective. 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. Required of English majors and open to others as an elective. Region: Europe.

- 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. Offered in spring semester of odd-numbered years. 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 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 330. 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. Offered annually in fall semester. Region: United States. Methodologically 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 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. Offered in spring of odd-numbered years. 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. Special attention will be given to the recent decolonization of Portugese Africa and Rhodesia and the continuing struggle against apartheid in South Africa. Offered in spring of even-numbered years. Region Africa/Asia/Latin America.
- HI 350. 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 407 is recommended. Offered in spring semester of even-numbered years. Region: Europe.
- HI 352. AMERICAN MILITARY HISTORY** 3—0—3
A survey of the development of the armed services of the United States since 1775, with emphasis on issues of strategy and policy. Region: United States.
- HI 354. GREAT BATTLES AND COMMANDERS IN HISTORY** 3—0—3
Traces the history of warfare from ancient times to the present. The course emphasizes two dozen decisive battles in world history, tying them together by discussion of changes in technology and tactics. The course stresses causes and effects of war, the impact of technology and leadership, and the historical significance of key battles. Region: Europe or United States, but not both.
- 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 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. THE FRENCH REVOLUTION AND NAPOLEON** 3—0—3
A study of the collapse of the Ancien 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. Offered in fall of odd-numbered years. Region: Europe. Methodologically intensive.
- 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. Prerequisite: Admission to the History Honors Program.

- 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.
- 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.
- 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 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 388. MODERN SPAIN: CIVIL WAR AND COLONIAL** 3—0—3
Colonial ventures in the Americas, the Pacific, and North Africa during the nineteenth and twentieth centuries played a major role in the shaping of contemporary Spain, as did several long and bloody civil wars. This course aims to introduce students to these themes and to modern Spanish history in general, from the guerrilla struggles against Napoleon to the long-lasting dictatorship of Francisco Franco, the transition to democracy that followed, and the ongoing issues of regional nationalism and terrorism. Course requirements will include regular class participation, a short essay or review, at least one in-class presentation, midterm and final examinations, and a substantial annotated bibliography. Readings will include a survey text, a first-hand account (e.g. George Orwell's *Homage to Catalonia*), and primary documents in translation. Region: Europe. Methodologically intensive course.
- HI 389. HISTORY OF EUROPEAN WARFARE SINCE 1871** 3—0—3
This course will introduce students to major aspects of European warfare from the unification of Germany in 1871 through World War II. 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 the evolution of military thought and operations; technology, social change and war; public opinion and the armed forces; and the relationship between war and politics. Course requirements will include regular class participation, one short essay or review (3-5 pp.), one class presentation, a midterm, a longer paper (at least 8-10 pp.), and a final examination. Readings Peter Paret, ed., *Makers of Modern Strategy*, a survey text, and selected primary documents. Region: Europe.
- 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 life, 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.
- 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 410. RESEARCH SEMINAR: SOCIAL & ECONOMIC HISTORY OF THE VALLEY OF VIRGINIA** 3—0—3
Offers instruction in the sources, methods and approach of local and regional-level historical analysis. Emphasizes the development of research and writing skills and the use of primary sources in historical research. Requires a research paper, but no final exam. No prerequisite, but HI 315 is recommended. Region: United States. Methodologically intensive.
- HI 425. TECHNOLOGY AND SOCIETY SINCE THE INDUSTRIAL REVOLUTION** 3—0—3
An examination of major developments in western technology since the Industrial Revolution and the impact of modern technology on society. Offered in the fall of even-numbered years. Region: Europe.
- HI 426. 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. Enrollment limited to 15. Region: Europe.
- HI 430. 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.
- HI 451. 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 452. 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 453. 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 454. THE MEDIEVAL WORLD** 3—0—3
An upper-level survey course on the history of Western Europe from the fall of Rome to the eve of the renaissance. Region: Europe.
- HI 460. CAPSTONE EXPERIENCE** 3—0—3
Topics vary. Prerequisite: methodologically intensive course, possibly others at discretion of instructor. Required of history majors. History courses numbered 200 or higher, while in residence at VMI, and at least a 3.0 GPA in history courses taken at VMI.
- HI 474. 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 of the religious struggles of the Reformation era. Offered spring of even-numbered years. Region: Europe.
- HI 480. DIRECTED STUDY** 3—0—3
Research and writing of a paper under supervision of a faculty sponsor, followed by oral examination before an *ad hoc* committee. Prerequisite: Permission of the department head, completion of twelve hours of history courses numbered 200 or higher, while in residence at VMI, and at least a 3.0 GPA in history courses taken at VMI.
- HI 481. SOUTHERN LIVES IN THE 20TH CENTURY** 3—0—3
A readings seminar designed to promote understanding of the history and culture of the twentieth-century American South through an examination of primary literature, supplemented by lesser attention to secondary accounts pertinent to interpreting this body of literature. A diverse assortment of people and experiences will be revealed through intensive reading and discussion of memoirs, diaries, letter collections, oral history interviews, and autobiographies. A paper of approximately fifteen pages, utilizing the theme of southern distinctiveness as a vehicle to integrate and interpret the readings, will be due at the end of the term. Enrollment is limited to 12 students. Region: US. Prerequisite: HI 205 or HI 206.
- 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. Cadet's letter of application must indicate which regional requirement this course will satisfy.
- HI 491. THESIS COURSE FOR HONORS** 3—0—3
Preliminary work on a research paper based on the reading done in HI 372. Prerequisite: HI 372. Cadet's letter of application must indicate which regional requirement this course will satisfy. Writing intensive.
- HI 492. THESIS COURSE FOR HONORS** 3—0—3
Embraces the completion of the research paper begun in HI 491 and written and oral examination on the selected field of study. Prerequisite: HI 491. Cadet's letter of application must indicate which regional requirement this course will satisfy. Writing intensive.

HONORS PROGRAM

For information pertaining to the Institute Honors Program, please see page 20.

HN 100. HONORS FORUM 1—0—0

The Honors Forum presents a weekly opportunity for serious engagement of current events issues of national and international interest. Each participant receives a free subscription to a major news magazine or periodical, which is used to generate discussions. Participation is recorded by a P (pass) or F (fail) on the transcript. The forum is required each semester during which a cadet is enrolled at VMI and has been admitted to the Institute Honors Program. Prerequisite: Admission to the Institute Honors Program.

HNL 370-374. 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 *Africa in Modern Times* and *Elections and American Democracy*. Prerequisite: Admission to the Institute Honors Program.

HNS 375-379. 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

This course is devoted to research and completion of the Institute Honors thesis or project 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 complete the requirements for Institute Honors. Prerequisite: Admission to the Institute Honors Program and approval of the Institute Honors Committee.

JAPANESE

See Department of Modern Languages, page 110.

LEADERSHIP STUDIES & CAREER DEVELOPMENT

(Under Administrative Supervision of Department of Psychology and Philosophy.)

LS 300. LEADERSHIP IN ORGANIZATIONS 3—0—3

Organizational leadership is defined as the process of influencing others toward achieving goals prescribed by the organizationally appointed leader. This course critically reviews the major theories of leadership and provides practical advice about improving leadership effectiveness. The focus is on the interaction between the leader, the followers, and the situation. The course also addresses specific basic and advanced leadership skills designed to enhance both education and development. (Note: This course is especially useful for those cadets who aspire to leadership roles at VMI or in the corporate or military worlds.) Prerequisite: None; just bring motivation.

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 301, 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 302, or NS 304. The class focuses on leadership theory, the concept of organizational climate, teamwork in organizations, leader ethics, and other workplace issues.

LS 371. LEADERSHIP IN ORGANIZATIONS 3—0—3

Organizational leadership is defined as the process of influencing others toward achieving goals prescribed by the organizationally appointed leader. This course critically reviews the major theories of leadership and provides practical advice about improving leadership effectiveness. The focus is on the interaction between the leader, the followers, and the

situation. The course also addresses specific basic and advanced leadership skills designed to enhance both education and development. (Note: This course is especially useful for those cadets who aspire to leadership roles at VMI or in the corporate or military worlds.) Prerequisite: None.

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 401. 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 Bennell, Gluck, Lominac, Piegari, Than, Tierney), and Walsh; Lieutenant Colonels Baker, Dewald (Head) and Siemers; Major Hartman; Mr. Lowe, Mr. Parker, Ms. Randall and Ms. Stevens.

Requirements for a major in mathematics are specified on page 70.

Note: All cadets must have at least six hours of mathematics. MA 114 does not fulfill a mathematics requirement. MA 114 is acceptable as elective credit only with approval of a cadet's curricular head.

MA 105. INTRODUCTION TO PROBABILITY AND STATISTICS I 3—0—3

A study of problem solving skills, counting principles, finite probability theory, and descriptive statistics. Computer/calculator applications will be chosen to enhance understanding of the topics. Credit will not be given for both MA 105 and MA 118.

MA 106. INTRODUCTION TO PROBABILITY AND STATISTICS II 3—0—3

A continuation of MA 105. Topics include random variables, the binomial and normal distributions, correlation, regression, confidence intervals, and hypothesis testing. Computer/calculator applications will be chosen to enhance understanding of the topics. Prerequisite: MA 105 or MA 118.

MA 107. APPLIED STATISTICS FOR THE SOCIAL SCIENCES 3—0—3

Categorical data, contingency tables, analysis of variance, distribution-free alternatives. Non-credit course for mathematics majors. Prerequisite: MA 106.

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 115. See note above.

MA 115. CALCULUS WITH ANALYTIC GEOMETRY I 3-0-3

Plane analytic geometry with single variable calculus. Limits, derivatives, applications of derivatives, and derivatives of trigonometric functions. Credit will not be given for both MA 115 and MA 121.

MA 116. CALCULUS WITH ANALYTIC GEOMETRY II 3—0—3

A continuation of MA 115. Integration and its applications, exponential and logarithmic functions, and methods of integration. Prerequisite: A grade of C or better in MA 115.

MA 118. FINITE MATHEMATICS 3—0—3

Systems of equations, matrices, determinants, sets, counting, and probability. Credit will not be given for both MA 105 and MA 118.

MA 121. CALCULUS FOR ECONOMICS AND BUSINESS 3—0—3

A study of the basic concepts of differentiation and integration, emphasizing the techniques and applications relevant to business and economics. Credit will not be given for both MA 115 and MA 121.

MA 215. CALCULUS WITH ANALYTIC GEOMETRY III 4—0—4

A continuation of MA 116; 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 116.

- MA 216. CALCULUS WITH ANALYTIC GEOMETRY IV** 2—0—2
A continuation of MA 215. L'Hopital's rule, techniques of integration, infinite sequences and series, applications of series. Prerequisite: MA 215.
- 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 216.
- 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 or consent of department head.
- MA 305. ELEMENTARY LINEAR ALGEBRA** 3—0—3
Vectors; matrices; determinants; systems of linear equations; linear transformations. Prerequisite: MA 118 or consent of department head.
- MA 306. ELEMENTARY NUMBER THEORY** 3—0—3
Properties of integers, prime numbers, number theoretic functions, congruences. Diophantine equations.
- MA 311. ELEMENTARY DIFFERENTIAL EQUATIONS** 3—0—3
Ordinary differential equations; applications; Laplace transforms; selected topics from partial differential equations. Prerequisite: MA 116.
- MA 319. MATHEMATICAL METHODS OF OPERATIONS RESEARCH** 3—0—3
Mathematical modeling, linear programming, allocation models, network models, scheduling models. Prerequisites: MA 118 and MA 116.
- MA 326. PROBABILITY AND STATISTICS** 3—0—3
Simple, discrete, and continuous probability distributions. Sampling from probability distributions and finite populations. Prerequisite: MA 116.
- 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 transversability, 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 215 and MA 311 and programming experience in either Fortran or Pascal.
- 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, Tunge-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 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 Arthur, Hodges (head), Trandel, Neel, and Sadler; Captain Sexton; Major Hardin; and Major Hyre.

Requirements for a major in mechanical engineering are specified on page 74.

- ME 102. ENGINEERING—COMPUTER DRAWING** 0—2—1
A basic course in engineering drawing consisting of technical sketching and shape description, orthographic projection, isometric sketching and drawing, basic dimensioning, and computer-aided drafting. A final computer-aided design project is used to reinforce material.
- ME 105. INTRODUCTION TO MECHANICAL ENGINEERING** 0—2—1
Introduction to the engineering profession, its history, opportunities and responsibilities confronting the prospective engineer in a technical society. A study of engineering methods including engineering graphs and empirical equations; history, concepts, and use of electronic calculators and microcomputers.
- 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 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; centroids and centers of gravity. Corequisite: MA 116 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 204. INTRODUCTION TO SYSTEM DYNAMICS** 3—0—3
Dynamic modeling by linear and nonlinear lumped elements of physical systems. Unified treatment of active and passive mechanical, fluid, electrical, thermal, and electronic devices and systems through bond graphs. Concept of state and state variables. Formulation and solution of state equations by direct analysis, frequency domain transformations, and computer methods. Dynamic response and stability of linear systems. System transfer functions, pole-zero configurations, bode plots, and their interpretations. Extensive use of engineering examples. Prerequisite: MA 116 Corequisite: PY 207.
- 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 116 and 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 advisor.
- 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.
- 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 305. 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 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; compressible flow; principles of dimensional analysis and dynamic similitude. Prerequisite: MA 116 and 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 116.
- ME 312. THERMODYNAMICS II** 3—0—3
Gas-vapor mixtures, psychrometry and air conditioning process; real and ideal power, refrigeration, heat pump, and air compression cycles; fuels and combustion processes; compressible and incompressible flow and nozzles and diffuses; energy system design and computer applications. Prerequisite: 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 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: EN 102.
- ME 332. HEAT AND MASS TRANSFER** 3—0—3
Fundamental principles of heat transfer by conduction, radiation, and convection; are examined. Introduction to mass transfer. Contains elements of design of fins and composite walls. Finite difference techniques are introduced. Prerequisites: ME 311 and MA 311.
- ME 334. MECHANICAL ENGINEERING ENERGY LABORATORY** 0—2—1
Applied engineering investigations into the area of energy, thermodynamics and heat transfer. Real life engineering team experience in the use of laboratory testing and measuring equipment. Technical report writing and laboratory safety measures and practices are stressed. Corequisites: ME 312 and ME 332. Prerequisite ME 325.
- 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 advisor.
- 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, turbomachinery 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 312.
- 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 309 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.
- 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 309.
- 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 421. ENERGY CONVERSION DESIGN** 2—2—3
Application of thermodynamics, fluid mechanics, and heat transfer to energy conversion processes. Design of engines, heat exchangers, compressors, and power and refrigeration cycles. Prerequisites: ME 312, ME 332, and ME 309.
- 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 206.
- 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 305 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 312, ME 332, and ME 309.
- 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 421 and ME 425.
- ME 457. SEMINAR** 0—1—1/2
Weekly seminars will cover job placement, graduate schools, ethics, and design safety. Oral and written reports on engineering ethics case studies are required.
- ME 458. SEMINAR** 0—1—1/2
Weekly seminars will provide preparation for the Fundamentals of Engineering Exam that all mechanical engineering majors must take.
- 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 312 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 309, ME 312, ME 332, 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 modelling, 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.

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 Suthard (Head); Lieutenant Colonel Irby; Majors DeVarona, Friedhoff, and Wranek; Captains Brashears, J. Cook, R. Cook, and Dorn; and Sergeant First Class Goudy.

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): MS109, 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: MSL 419 (for contracted cadets), or LS 450 (for non-contracted 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 given 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), or LS 451 (for non-contracted 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 and 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).

DEPARTMENT OF MODERN LANGUAGES AND CULTURES

Brigadier General Farrell; Colonels Bulger-Barnett (head), Cerkey, and Sunnen; Lieutenant Colonel Dellinger; Major Messer; Dr. Taifi; Ms. Bentouhami, Ms. Burch, Ms. Hardin, Ms. Yamagami; and Ms. Watabe.

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. In all languages, classroom work is supplemented with audio-visual materials and 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, and in ML 201 before enrolling in ML 202. Proficiency in ML 202 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 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.

MC 355 and 356.

MC 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 advisor; 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.

ARABIC

AR 101. ELEMENTARY ARABIC I 3—1—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 structural principles. 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—1—3

A continuation of AR 101. Prerequisite: AR 101.

AR 201. INTERMEDIATE ARABIC 3—1—3

A continuation and systematic review of structural principles and an introduction to the reading and discussion of authentic 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—1—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. Prerequisite: AR 201.

AR 301. 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 302. ARABIC COMPOSITION AND CONVERSATION 3—0—3

A continuation of AR 301. Prerequisite: AR 301.

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 202. Recommended to cadets who have already successfully completed 302. The course will be conducted primarily in Arabic.

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: AR 202. Recommended for cadets who have successfully completed AR 302.

AR 316. TOPICS IN ARABIC 3—0—3

A capstone course for a cadet completing his/her modern language requirement. The goal is to provide information and foster discussion of diverse topics from the Arabic-speaking world and to reinforce cadet language skills. The principal language of instruction is Arabic. Prerequisite: AR 202. Recommended to cadets who have successfully completed AR 302.

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.

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: AR 302.

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.

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: AR 302.

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: Three 300-level courses in Arabic.

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: AR 302 and one other 300 level class.

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 300 level courses.

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 structural principles. 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. Prerequisite: FR 101.

FR 201. INTERMEDIATE FRENCH 3—0—3

Reviews principles of grammar and expands the student's conversational skills. 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. Prerequisite: FR 201.

FR 304. FRENCH COMPOSITION AND CONVERSATION 3—0—3

French as it is spoken and written today. Emphasis on fluency, phonetics, particularly oral structures, and the special lexicon of "street" or colloquial French as well as popular and modern forms of written French like journalism, correspondence, and advertising. Sources will include film, popular music, news broadcasts, native guest speakers from representative French-speaking regions, interviews and other means of access to contemporary French as spoken and written. Focus on the practical use of the language for purposes of day-to-day living and communicating. 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, when French was born, to the Existential writers of the XXth Century. Cadets will consider representative samples of the origin and development of all genres, poetry, narrative, exposition, drama as well as the evolution of the language itself. A Writing-Intensive Course (see catalogue description) 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**3—0—3**

Overview of history, art, politics, geography, educational and legal systems, reigning philosophy, ethos and mood of France and the French-speaking world, notably the former colonies of Indochina, Africa, the Carribean (the DOM-TOM) and Québec, each with its culture derived from but independent of continental France. Texts from a variety of sources including newspapers and the popular media, personal documents, official documents, literary expression, film, and the electronic global network. The course, in French, will enhance cultural awareness of Cadets and help prepare them for study abroad in a nation where French is spoken and French values practiced. Spoken and written French exercised. Prerequisite: French 202.

FR 315 INTRODUCTION TO FRANCOPHONIC TEXTS 3—0—3**3—0—3**

A course designed to build on the reading skills acquired in FR 201 and FR 202 by presenting cadets with a variety of texts drawn from many fields of interest: politics, business, literature, history. One principal source of materials will come from the global electronic network. The language of instruction will be French. Emphasis will be placed on developing good reading and writing skills. Prerequisite: FR 202.

FR 405 and FR 406. INDEPENDENT READING 3—0—3**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: at least 24 hours of French beyond FR 202 or permission of the Department Head.

FR 409. STYLISTICS IN FRENCH 3—0—3**3—0—3**

Recapitulation of grammar for advanced Cadets with special emphasis on expansion of vocabulary, development of style in speaking and writing, use of French for purposes other than literary. Materials used to focus class discussion and written assignments will be film, journalism, exposition, interviews, broadcast media, and other sources, largely though not exclusively non-literary. 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: at least two French courses at 300-level.

FR 410. NARRATIVE AND EXPOSITION IN FRENCH 3—0—3**3—0—3**

A systematic and diachronic study of narration in French, from Medieval epics and other early expressions of 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, Perce. Political theory and philosophical and scientific writings as well as tracts by moralists like Pascal or Descartes will supplement purely fictional accounts. Extensive reading and accountability by analytical writing about these documents. Prerequisite: French 305-306.

FR 411. DRAMA AND FILM IN FRENCH 3—0—3**3—0—3**

A systematic and diachronic study of forms 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 with its innovative French cinema, both "at" and popular. Extensive use made of film versions of the plays under study and of films themselves in their widest variety (documentary, experimental, pure entertainment). Extensive reading and accountability by analytical writing about these documents. Prerequisite: French 305-306.

FR 412. FRENCH POETRY AND POPULAR MUSIC 3—0—3**3—0—3**

A systematic and diachronic study of forms 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. Use of film and recording to appreciate these forms sung or spoken aloud. Extensive reading and accountability by analytical writing about these documents. Prerequisite: French 305-306.

FR 413. FRANCOPHONE OR NON-CONTINENTAL FRENCH 3—0—3**3—0—3**

A systematic and diachronic study of expression in French, the result of French colonial expansion and its aftermath, including works from Arabic Africa (the *Maghreb*), Black Africa, Indochina (Laos, Cambodia, Viet Nam), Canada and Louisiana, and the Carribean Basin. Study will focus on the liberation of colonial peoples and their persistent loyalty to elements of French culture and civilization through the continued (and brilliant) use of the language of French to capture their aspiration, their inspiration, and their frustration. Extensive reading and accountability by analytical writing about these documents. Prerequisite: French 305-306.

FR 414. THEMES, FIGURES, PERIODS, REGIONS 3—0—3**3—0—3**

A focused course offering detailed study of a given theme, not necessarily literary, in French culture, society, or history (colonialism, revolution, race, proto-science, economic and political theory for example), a given author through study of all his or her works (Beauvoir, Duras, Gide St-Expupéry, Joan of Arc, Napoleon, for example), a period of innovation in theory of creation (Symbolism, Existentialism, Renaissance, Exploration), or an area of particular interest (French Carribean). The course will be offered as appropriate to Cadet preparation or when sufficient interest arises. Extensive reading and accountability by analytical writing about these documents. Prerequisite: French 305-306.

GERMAN**GR 101. ELEMENTARY GERMAN 3—1—3****3—1—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 structural principles. Secondary emphasis on the cultures where German is spoken. Intended for beginners with no previous experience in the language.

GR 102. ELEMENTARY GERMAN 3—1—3**3—1—3**

A continuation of GR 101. Prerequisite: GR 101.

GR 202. INTERMEDIATE GERMAN 3—1—3**3—1—3**

A continuation of GR 201. Prerequisite: GR 201.

GR 202. INTERMEDIATE GERMAN 3—1—3**3—1—3**

A continuation of GR 201. Prerequisite: GR 201.

GR 303W. INTRODUCTION TO CONTEMPORARY GERMAN CULTURE 3—0—3**3—0—3**

A study of contemporary German issues including cultural events, travel, economy, politics, education, transportation, and public opinion. Prerequisite: GR 202.

GR 304W. INTRODUCTION TO CONTEMPORARY GERMAN CULTURE II 3—0—3**3—0—3**

A study of contemporary German issues focusing on economy and German for business. Prerequisite: GR 202.

GR 307. LITERATURE SURVEY (1100-1700) 3—0—3**3—0—3**

Authors and works include: the *Nibelungenlied*, Hartmann von Aue, Martin Luther, Hans Sachs, Andreas Gryphius and others. Prerequisite: GR 202.

GR 405 and GR 406. SEMINAR IN GERMAN LITERATURE 3—0—3**3—0—3**

Advanced study of selected topics in German literature. Offered on demand. Conducted in German. Prerequisites: 24 hours of German beyond German 202 or permission of the department head.

GR 411. VIENNA, BERLIN, AND BETWEEN: GERMANY AND AUSTRIA FROM 1911-1950 3—0—3**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**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**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 420. ADVANCED CONVERSATION AND COMPOSITION 3—0—3**3—0—3**

Students examine, discuss, and debate current events of political and military topics, such as the restructuring (and deployment of the Bundesweh 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.

GR 421. IMMIGRATION TO AND FROM GERMANY SINCE 1850 3—0—3**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.

JAPANESE

JP 101. ELEMENTARY JAPANESE 3—1—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 structural principles. Secondary emphasis on the culture of Japan. Intended for beginners with no previous experience in the language.

JP 102. ELEMENTARY JAPANESE 3—1—3
A continuation of JP 101. Prerequisite: JP 101.

JP 201. INTERMEDIATE JAPANESE 3—1—3
A continuation and systematic review of structural principles and an introduction to the reading and discussion of authentic materials and 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—1—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. 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 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.

JP 471. 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.

SPANISH

SP 101. ELEMENTARY SPANISH 3—1—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 structural principles. Secondary emphasis on the culture where Spanish is spoken. Intended for beginners with no previous experience in the language.

SP 102. ELEMENTARY SPANISH 3—1—3
A continuation of SP 101. Prerequisite: SP 101.

SP 201. INTERMEDIATE SPANISH 3—1—3
A systematic review of grammar and the readings of texts of significant literary or historical value. Composition, aural and oral work continued. Prerequisite: SP 102.

SP 202. INTERMEDIATE SPANISH 3—1—3
A continuation of SP 201. Prerequisite: SP 201.

SP 203. INTERMEDIATE SPANISH FOR BUSINESS 3—1—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 provide a cultural and technical background. Students who successfully complete SP 203 will receive credit for third-semester Spanish (equivalent to SP 201) and are eligible for SP 204: Spanish for Business II. Prerequisite: SP 204.

SP 204. INTERMEDIATE SPANISH FOR BUSINESS 3—1—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 204.

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.

SP 305. SURVEY OF SPANISH LITERATURE 3—0—3
SP 305 is 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. Research paper required. Prerequisite: SP 202.

SP 306. SURVEY OF SPANISH AMERICAN LITERATURE 3—0—3
SP 306 is a survey of Spanish American literature from independence to the present with selected readings from the major authors, literary movements, and genres. Conducted in Spanish. Prerequisite SP 202.

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 following the guidelines of the Modern Language Association (MLA). Conducted in Spanish. Prerequisite: one 300-level course.

SP 312. CULTURE AND CIVILIZATION OF SPAIN 3—0—3
A study of Spain's cultural identity from prehistoric to contemporary times. By juxtaposing popular stereotypes with artistic, literary, political, and societal artifacts, the course will explore the events and attitudes that have molded the idea of *españolismo* both within and beyond the Peninsula. Conducted in Spanish. Recommended for cadets returning from or planning study abroad in Spain. Prerequisite: SP 202.

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 will be chosen from a variety of sources including newspapers, original documents, literary works, government documents, and the global electronic network. Emphasis on Writing and Conversation. Conducted in Spanish. Prerequisite: SP 202.

SP 315. INTRODUCTION TO HISPANIC TEXTS 3—0—3
A course designed to build on the reading skills acquired in SP 202 by presenting cadets with a variety of texts drawn from many fields of interest: politics, business, literature, history. One source of materials will come from the global electronic network. The language of instruction will be Spanish. Emphasis will be placed on acquiring good reading and writing skills. Prerequisite: SP 202.

SP 316. TOPICS IN SPANISH 3—0—3
A topics course that is intended as a capstone course for the cadet who is completing modern language requirement. 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.

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 from genres such as drama, poetry, narrative, and essay. Includes study of the cultural and literary backgrounds of the authors read. Emphasizes speaking and writing. Taught in Spanish. Prerequisite: SP 202.

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.

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.

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 term paper required. Conducted in Spanish. Prerequisite: 24 semester hours of Spanish beyond SP 202 or permission of the department head.

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 SPANISH LITERATURE 3—0—3

A cross-generational study of 19th century works from the perspective of the author (19th century), film-maker (20th century), and reader/viewer (21st century). Readings from all four major literary genres as well as film adaptations of representative works are required. Conducted in Spanish. Research paper required. 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

A close 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

A close 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 the dramatic historical events of the era. 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: six hours at the 300-level.

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: six hours at the 300 level.

MUSIC

(Col. Brodie)

MU 101-106. CONCERT BAND AND ENSEMBLE 0—1—1/2

Open to cadets who perform on brass, woodwind, and percussion instruments. Traditional and contemporary wind-band literature and music theory will be studied and performed. Prerequisite: satisfactory audition and consent of instructor.

DEPARTMENT OF NAVAL SCIENCE

Colonel Grace, USMC (Head); Major Laninga, USMC; Lieutenant Hardt, USN; Lieutenant Brown, USN; Lieutenant Faison USN; Lieutenant Encke, USN; Captain Garaux, USMC.

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 one semester of computer science. 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

Nav and Marine option. A general introduction to the Naval profession and to concepts of sea power. The 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

Nav 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

Nav 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.

NS 206. EVOLUTION OF WARFARE I 2-0-1

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 I 2-0-2

Marine option. The purpose of Amphibious Warfare I examines the principles of warfare from the perspective of amphibious warfare. Amphibious Warfare I will cover the time period of the Battle of Gallipoli during WW I and proceed through the Inter-War period and finally closely examine the Pacific Campaign of World War II. The student will use the information provided in these classes to build a foundation on knowledge for decision and action based on historical reviews of amphibious operations.

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 on knowledge for decision and action based on historical reviews of amphibious operations.

NS 308. NAVAL ENGINEERING 2-0-1

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.

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 I LAB 0-1-0

Marine option The purpose of the lab is to provides the student 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. Corequisite NS 303.

NS 314. AMPHIBIOUS WARFARE II LAB	0-1-0	PE 100. BEGINNING SWIMMING	0-2-1V2
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. Corequisite: NS 304.		This course is for non-swimmers only.	
NS 402. LEADERSHIP AND ETHICS	1-0-2	PE 101. BASIC SWIMMING AND SURVIVAL	0-1-1V2
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.		Stressed are the basic strokes, survival support, breath control skills, and prelifesaving skills.	
NS 403. EVOLUTION OF WARFARE II	2-0-2	PE 102. BOXING	0-1-1V2
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 18 th and 19 th 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.		Instruction in the fundamentals of boxing.	
NS 408. NAVAL OPERATIONS AND SEAMANSHIP	2-0-2	PE 200. DRUG AND ALCOHOL ABUSE AWARENESS	1-0-1V2
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.		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.	
NS 411. NAVY LEADERSHIP LAB I	0-2-0	PE 211. WRESTLING	0-1-1V2
Navy option. This lab is designed to reinforce the basic skills, organizational knowledge and command techniques that prospective ensigns will employ in the Naval Operating Forces; an introduction to junior officer leadership and management. Corequisite: NS 401.		Fundamentals of wrestling.	
NS 412. NAVY LEADERSHIP LAB II	0-2-0	PE 300. PRINCIPLES OF PHYSICAL CONDITIONING	0-1-1V2
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.		An elementary course in exercise physiology.	
NS 413. MARINE LEADERSHIP LAB I	0-2-0	PE 320. DRUG AND ALCOHOL PROBLEMS	3-0-3
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.		A study of the substances being abused — the effects, prevention, diagnoses, intervention, treatment, corporate strategies, laws.	
NS 414. MARINE LEADERSHIP LAB II	0-2-0	PE 401. GOLF	0-1-1V2
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.		A beginning course. Offered during fall semester only.	
		PE 402. LIFEGUARDING	0-1-1V2
		Successful completion leads to certification as a lifeguard. Prerequisite: PE 304.	
		PE 403. ADVANCED SWIMMING AND SURVIVAL	0-1-1V2
		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.	1-0-1V2
		Successful completion confers American Red Cross certification. This course is a prerequisite for PE 103, Lifeguarding.	
		PE 405. DIETARY SUPPLEMENTS	1-0-1V2
		Provides information on the benefits and detriments of common physical performance stimulants	
		PE 406. HANDBALL/RACQUETBALL	0-1-1V2
		A beginning course.	
		PE 407. VOLLEYBALL	0-1-1V2
		A beginning course.	
		PE 408. GYMNASTICS AND TUMBLING	0-1-1V2
		Instruction and practice in both activities will be provided during spring semester only.	
		PE 409. TENNIS	0-1-1V2
		A beginning course. Offered during fall semester only.	
		PE 410. WEIGHT TRAINING	0-1-1V2
		Fundamentals of weight lifting.	
		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.	

***Cadets who are not seeking a contract or a commission may enroll in a Leadership and Management Development course (LS) instead of the NROTC lab. Labs must be taken concurrently with the appropriate NROTC lecture course.**

DEPARTMENT OF PHYSICAL EDUCATION

Colonels Calkins and Coale (head), Richardson, and Stockwell; Captains Joyce, Powell and Sykes.

All cadets are required to take eight consecutive semesters of physical education and earn four semester credit hours (exclusive of PE 430) to meet graduation requirements. New cadets will take swimming (PE 100 or 101) one semester and boxing (PE 102) the other. Third classmen will take PE 200 one semester and PE 211 the other. Second classmen will take PE 201 one semester and a PE elective the other. First classmen will take a PE elective each semester. Each course has a physical fitness component, measured by a physical fitness test, that constitutes 25 percent of the final grade.

DEPARTMENT OF PHYSICS AND ASTRONOMY

Colonels DuPuy (Head); Lt. Col. Vargas; Majors G. Topasna and D. Topasna; Major Brooke; and Mr. Allen.

Requirements for a major in physics are specified on page 80.

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.)

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.)

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.

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 208 and AT 201 or AT 204 or consent of the instructor.

PHYSICS

PY 101. INTRODUCTION TO PHYSICS AND ASTRONOMY 2—0—2

A course to be taken by physics majors in their first semester at VMI. Its purposes are: to provide an overview of the fields of physics and astronomy, to provide some instruction in the use of Excel spreadsheets and PowerPoint presentation software, and to cover kinematics and a portion of dynamics. This course is restricted to physics majors only.

PY 108. GENERAL PHYSICS I 3—2—4

The first semester of a two-semester sequence of introductory physics courses. Topics include elementary classical mechanics, gravitation, fluids, and thermodynamics. This course is restricted to physics majors only. Prerequisite: PY 101.

PY 201. GENERAL PHYSICS I 3—0—3

PY 202. 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: For PY 202, PY 201.

PY 203. GENERAL PHYSICS 2 3—2—4

This is the final course of the general physics sequence for physics majors. It includes a study of waves, sound, and electricity and magnetism. Prerequisite: PY 108 or PY 207.

PY 207. GENERAL PHYSICS I 3—0—3

PY 208. 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. This sequence is not suitable for physics majors. Prerequisites: For PY 207, proficiency in MA 115; for PY 208, PY 203 or PY 207.

PY 211. LABORATORY FOR PY 201 0—2—1

A laboratory course to investigate the concepts covered in PY 201. Computer generated graphs, spreadsheets, and regression analysis are required for most experiments. Corequisite: PY 201.

PY 212. LABORATORY FOR PY 202 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 202.

PY 217. LABORATORY FOR PY 207 0—2—1

A laboratory course to investigate the concepts covered in PY 207. Computer generated graphs, spreadsheets, and regression analysis are required for most experiments. Corequisite: PY 207.

PY 218. LABORATORY FOR PY 208 0—2—1

A laboratory course to investigate the concepts covered in PY 208. Computer generated graphs, spreadsheets, and regression analysis are required for most experiments. Corequisite: PY 208.

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 the FORTRAN programming language 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 0—2—1

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: Either PY 203 or PY 208.

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 208.

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 300. DIGITAL PHOTOGRAPHY 2—2—3

This course will teach the basic techniques of the rapidly growing medium of digital photography. The course will begin with an introduction to camera techniques. Basic digitization techniques, including halftone, gray scale, duotone and color will be covered. Assignments include scanning b&w and color images. Approximately 40% of the course will cover image manipulation, using industry standard software and Photo-CD's.

PY 304. INTRODUCTION TO PHOTOGRAPHY 2—2—3

An introductory course in basic photographic methods, covering b&w darkroom techniques, closeups, lighting and print mounting. Assignments and darkroom work are self-paced. No previous photographic experience is expected. A suitable 35mm SLR camera is required. Enrollment limited to 15.

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, nanoterrorism, social and ethical implications, etc. Prerequisite: PY 207/PY 208 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. An oral presentation is required.

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 343.

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 333 and PY 343.

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 magnetostatic 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 208.

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 343. MODERN PHYSICS 3—0—3

A study of the physics of atoms, molecules and nuclei, the special theory of relativity to include relativistic kinematics and dynamics, the early quantum theory, wave-particle duality, the Uncertainty Principle, the Bohr atom, nuclear properties, nuclear models, radioactive decay, nuclear reactions, fission, fusion, elementary particles — their properties, production, and detection. Prerequisite: Either PY 203 or PY 208.

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.

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 401. SENIOR SEMINAR 1—0—1

Weekly seminars will cover current technical topics in astronomy and physics. Graduate school and employment will also be discussed. Assistance will be provided in preparation for the Graduate Records Exams and the Major Fields Tests. Outside speakers will conduct some seminar sessions. This course is restricted to first-class physics majors.

PY441. 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 207, MA 311.

PY 442. CLASSICAL MECHANICS II 3—0—3

A more in-depth study of Lagrangian mechanics and rigid body rotations. An introduction to Hamiltonian mechanics, noninertial reference frames, coupled oscillations, and continuous media and the foundation of covariant mechanics via the special theory of relativity. Prerequisite: PY 441.

PY 444. CONDENSED MATTER PHYSICS 3—0—3

An introduction to the physical properties of solids; crystal structure, X-ray diffraction, lattice vibrations, free electron model of metals, electrical conductivity of metals, semiconductor theory and devices. (Offered when enrollment justifies.) Prerequisite: PY 343.

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 343.

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 450. ADVANCED LABORATORY 0—2—1

A laboratory course which provides a great degree of flexibility, in that it may include the performance of some advanced experiments, or perhaps to undertake a project wherein the student may work to develop experiments, which may subsequently be incorporated into existing laboratory courses. Prerequisite: Consent of instructor.

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 208.

PY 457. 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 459. INTRODUCTION TO QUANTUM MECHANICS 3—0—3

A rigorous study of the foundations of Quantum Mechanics. Topics include mathematical solutions to the Schrodinger equation, harmonic oscillator, Dirac notation, commutator relations and the hydrogen atom. Prerequisites: PY 343 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 INTERNATIONAL STUDIES AND POLITICAL SCIENCE

Colonels Burnett and Mayerchak (Head), Captain Turner; Lieutenant Colonel Hentz; Commander McElhannon; Majors Foster and Kleinerman; Majors Foster and Kleinerman; Dr. Hagerty (Spring '06) and Dr. Stempel; Mr. Ayer, Mr. Crisp and Mr. Russell.

Requirements for a degree in international studies and political science are specified on page 67.

**PO 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, open to all cadets.

PO 314. 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.

PO 325. 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.

PO 326. 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.

PO 327. 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.

PO 328. 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.

PO 331. 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.

PO 333. 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.

PO 334. 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.

PO 342. 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. Offered Spring Semester of odd-numbered years.

PO 343. 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.

PO 344. 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.

PO 345W. 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 post-colonial 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.

PO 346. 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.

PO 389. 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.

PO 401. 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.

PO 402. 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.

PO 403. 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.

PO 407. PUBLIC SECTOR SEMINAR 3—0—3

An introduction to the field of public administration, focusing on the role of public sector professionals. Topics covered include management, organizational dynamics, quantitative methods, and public administration theory. Prerequisite: 2nd class standing.

PO 430. INTERNATIONAL RISK ANALYSIS 3—2—3

The course analyzes risks commonly encountered in international business operations, foreign investment, and other international activity. Focusing primarily on current issues in the countries of Central and Eastern Europe as a basis for discussion, the course will describe methodology for standardized country risk analysis. Special emphasis is given to essential presentation techniques and recommended courses of action for each situation. Utilizing a seminar format, students present a series of graded written and oral briefings dealing with analysis of a specific issue or threat. The course emphasizes analytical and presentation techniques essential for post-graduate study or career activity.

PO 431. CORPORATE RISK SEMINAR 3—0—3

The Corporate Risk Seminar will conduct risk analysis research on international business and political problems for corporate executives. The seminar will be closely modeled on actual corporate research units in the private sector. Executives will provide questions and issues of immediate concern for their own business objectives and they will be the sole extra-mural beneficiaries of the final research. Research conclusions and recommended courses of action will be delivered to the cooperating executives by written and – where appropriate – oral briefings conducted by students at corporate headquarters. Students benefit from exposure to corporate research requirements and methodology, extensive interdependence in the conduct of research, and high-profile oral debriefings. Projects will vary in length and usually involve team contributions. Prerequisites: one of the following: International Risk Analysis, International Economics or International Political Economy, or permission of the department head.

PO 434W. 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.

PO 438. 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.

PO 440. 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.

PO 478. NATO AND INTERNATIONAL SECURITY 3—0—3

The course will examine the European security environment at the end of World War II and how the war's end state, along with the Soviet Union's expansive foreign policy, led to the creation of NATO. During the Cold War, NATO had a very specific purpose and the course will examine how the Alliance reacted to various security challenges during that time. As the Warsaw Pact dissolved, NATO evolved to meet the needs of the new security environment, including the conflict in the Balkans. At the same time, NATO sought to increase security by increasing incentives for the former Warsaw Pact countries (through Partnership for Peace) to democratize their militaries. This policy of engaging the former Warsaw Pact countries including those in Afghanistan, and consideration for NATO's future role in the international security environment, particularly with respect to the Global War on Terrorism.

PO 481-489. SPECIAL SEMINAR 3—0—3

Seminars on special topics in politics as suggested from time to time by members of the faculty or groups of cadets.

PO 490. 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: Permission of the 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 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.

SS 358. SCIENCE AND SECURITY INTERDISCIPLINARY CAPSTONE RESEARCH SEMINAR 3—0—3

This course brings together cadets and faculty from different disciplines to address an important national security/homeland defense problem. Cadets will research and write a substantial paper which focuses on a science- or engineering-based problem and which examines the policy implications and alternatives for addressing it. This course will be offered as part of the Science and Security Summer Research Institute to be conducted in Washington, D.C. and/or at VMI. This course will also be offered during the regular academic year for those cadets unable to participate in the summer program.

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.

DEPARTMENT OF PSYCHOLOGY AND PHILOSOPHY

Captain Hughes (Head); Colonels Eicher, Gire Meriwether, and Richarde; Lieutenant Colonels Ojura and Richter; Dr. Hutchens.

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 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?

PSYCHOLOGY

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.

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 203.

PS 290 and PS 291. INDEPENDENT RESEARCH 0—4—2
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.

PS 292 and PS 293. INDEPENDENT RESEARCH 0—4—2
0—8—4
These courses are for rising second classmen pursuing research during the summer. Permission of instructor and department head required.

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 303. ORGANIZATIONAL BEHAVIOR AND LEADERSHIP 3—0—3
A course dedicated to the study of organizational behavior and leadership effectiveness. Case studies, practical exercises, films, and assessment instruments challenge the student to become "consultants" in organizational effectiveness. The emphasis is on applied issues regarding leadership, personality, motivation, attitudes, group processes, power and influence, and organizational structure, design and development. Note: PS 303 is a prerequisite for PS 495 and is a required course for the minor in leadership studies. 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.

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 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.

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.

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 2—2—3
A laboratory course covering the principal areas of general and experimental psychology. Prerequisites: PS 201 and MA 107.

PS 403W. INDEPENDENT PROJECT 3—0—3
A continuation of PS 402. Prerequisite: PS 402.

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: 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: 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. Prerequisite: PS 303 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 110.

SPEECH

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

SE 300. PUBLIC SPEAKING 1—0—1
A study of basic principles of oral communications. Communication theory, student speeches of information and persuasion, with classroom criticism and discussion. Videotaping of speeches makes possible self-criticism.

VIRGINIA MILITARY INSTITUTE

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* On leave, 2004-2005
** On leave, first semester 2004-2005
*** On leave, second semester 2004-2005
Y Taught first semester, 2004-2005
YY Taught second semester, 2004-2005
YYY Taught 2004-2005 (both semesters)

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- ALBERT L. DEAL, III, Colonel, Emeritus Professor of Mathematics and Computer Science. B.S., M.A., Ph.D., University of North Carolina; M.S., University of Virginia. (1962; 2003)
- MARY ANN DELLINGER, Lieutenant Colonel, Associate Professor of Modern Languages and Cultures. B.A., University of New Mexico; M.A., Ph.D., Arizona State University. (2001; 2004)
- LEE S. DEWALD SR., Lieutenant Colonel, USA (Ret.), Associate Professor of Mathematics and Head of the Department of Mathematics and Computer Science. B.S., The Citadel; M.B.A., Long Island University; M.S., Ph.D., Naval Postgraduate School. (2002; 2002)
- SAMUEL W. DOBYNS, Colonel, Emeritus Professor of Civil Engineering. B.S., Virginia Military Institute; M.S., Lehigh University; Professional Engineer; Certified Land Surveyor. (1946; 1985)
- TIMOTHY DOWLING, Major, Assistant Professor of History. B.S., Texas Christian University; M.A., University of Virginia; Ph.D., Tulane University. (2001; 2001)
- FLOYD H. DUNCAN, Colonel, John W. and Jane M. Roberts Institute Professor of Free Enterprise Economics and Professor of Economics and Business. B.S., Virginia Military Institute; M.B.A., Ph.D., University of South Carolina. (1978; 1986)
- DAVID L. DU PUY, Colonel, Professor and Head of Physics and Astronomy and Holder of the Cameron Professorship in Physics and Astronomy. A.B., King College; M.A., Wesleyan University; Ph.D., University of Toronto. (1982; 1986)
- JAMES M. EICHER II, YYY, Colonel, USMC (Ret.), Lecturer in Leadership Studies. B.A., Pennsylvania State University; M.A., Webster University. (1996; 1996) P/T
- RONALD A. ERCHUL, Captain, Professor of Civil Engineering. B.S., United States Naval Academy; M.S., Naval Postgraduate School; Ph.D., University of Rhode Island; Certified Professional Geologist; Professional Engineer. (1981; 1988)
- ALAN F. FARRELL, Brigadier General, Professor of Modern Languages and Cultures. B.A. Trinity College; M.A. - French, M.A. - German, Ph.D., Tufts University. (1995; 2001)
- DEAN FOSTER, Emeritus Professor of Psychology. A.B., Indiana University; Ph.D., Cornell University. (1961; 1985)
- DENNIS M. FOSTER, Major, Assistant Professor of International Studies and Political Science. B.A., Farleigh Dickinson University; M.A., Ph.D., The Pennsylvania State University. (2004)
- CHARLES E. FRALEY, Colonel, Professor of Economics and Business. B.S., East Central State University; B.S., Southwestern Oklahoma State University; M.A., Ph.D., University of Oklahoma. (1980; 2000)
- THOMAS B. GENTRY, Colonel, Emeritus Professor of English and Fine Arts. B.A., Centre College; B.A., Virginia Military Institute; M.A., Ph.D., University of Kentucky. (1948; 1998)
- B. McCLUER GILLIAM, Colonel, Emeritus Professor of History and Political Science. B.A., Virginia Military Institute; M.A., University of Virginia; Ph.D., Princeton University. (1949; 1985)
- JAMES T. GIRE, Colonel, Professor and Head of Psychology and Philosophy. B.Sc., University of Jos; M.Sc., London School of Economics; Ph.D., McMaster University. (1994; 1999)
- MYRON H. GLUCK, Colonel, Professor of Mathematics and Computer Science. B.S., University of Michigan; M.A., University of Oklahoma; Ph.D., Syracuse University. (2001; 2005)
- EDWIN J. GOLLER, Colonel, Emeritus Professor of Chemistry. B.S., Merrimack College; M.S., Northeastern University; Ph.D., University of New Hampshire. (1969; 1999)
- KAREN GUTERMUTH, Lieutenant Colonel, Associate Professor of Economics and Business. B.S., Ph.D., Louisiana State University. (1997; 2002)
- CHARLES V. HARDENBERGH, Major, Assistant Professor of Economics and Business. B.A., Virginia Military Institute; M.S., J.D., University of Virginia (2004; 2004)
- JON-MICHAEL HARDIN, Lieutenant Colonel, Associate Professor of Mechanical Engineering. B.S., M.S., University of South Carolina; Ph.D., University of Illinois at Urbana-Champaign; Professional Engineer. (1998; 2004)
- PATRICIA D. HARDIN, Instructor of Modern Languages and Cultures. B.A., University of South Carolina; M.A., University of Illinois at Urbana-Champaign. (2000, 2000) P/T
- CLIFFORD D. HARMON, Instructor of History. B.A., Auburn University; M.A., University of New Orleans; Ph.D., University of Virginia. (1999; 1999) P/T
- D. ALEXIS HART, Lieutenant Commander, Assistant Professor of English. B.A., University of Rochester; Ph.D., University of Georgia. (2004; 2004)
- GREGOR N. HARTMAN, Major, Assistant Professor of Mathematics. B.S., Liberty University; M.S., Ph.D., Virginia Polytechnic Institute and State University. (2005; 2005)
- WILLARD M. HAYS, Colonel, Emeritus Professor of History. B.A., Virginia Military Institute; M.A., Ph.D., University of Tennessee. (1961; 1994)
- JAMES J. HENTZ, Lieutenant Colonel, Assistant Professor of Political Science. B.A., Saint Joseph's College; M.A., Georgetown University; Ph.D., University of Pennsylvania. (1997; 2002)
- MELVYN A. HERWALD, Instructor of Electrical and Computer Engineering. B.S., M.S., Carnegie Mellon. (2004; 2004) P/T
- EILEEN T. HINKS, YYY, Instructor in Chemistry. B.S., Ursinus College; Ph.D., Temple University. (1998; 1998) P/T
- PETER W. HOADLEY, Colonel, Professor of Civil Engineering. B.S., Vanderbilt University; M.S., Ph.D., University of Texas. Professional Engineer. (1988; 1995)
- TIMOTHY M. HODGES, Colonel, Professor and Head of Mechanical Engineering and Engineering Division Coordinator. B.S., Virginia Military Institute; M.S., Montana State University; Ph.D., University of Virginia; Professional Engineer. (1980; 1995)
- WILLIAM G. HUGHES, Captain, Emeritus Professor of Psychology. A.B., A.M., College of William and Mary; Ph.D., Pennsylvania State University. (1981; 1987)
- ROBERT HUMSTON, Major, Assistant Professor of Biology. B.A., Bowdoin College; Ph.D., University of Miami. (2004; 2004)
- LOUIS R. HUNDLEY, Colonel, Emeritus Professor of Biology. B.S., Virginia Military Institute; M.S., Ph.D., Virginia Polytechnic Institute and State University. (1950; 1989)
- STEWART HUSTED, Colonel, John W. and Jane M. Roberts Chair in Free Enterprise Business. B.A., Virginia Tech., Ph.D., Michigan State. (2003; 2003)
- BENJAMIN HUTCHENS, Instructor in Philosophy. M.Phil., Helsinki University; D. Phil., Oxford University. (2003) P/T
- MATTHEW R. HYRE, Lieutenant Colonel, Associate Professor of Mechanical Engineering. B.S., United States Military Academy; M.S., Villanova University; Ph.D., Massachusetts Institute of Technology; Professional Engineer (2001; 2001)
- DONALD K. JAMISON, Colonel, Emeritus Professor of Civil Engineering; Academic Adviser for Intercollegiate Athletics. B.S., Virginia Military Institute; M.S., University of California; Ph.D., University of Wisconsin; Professional Engineer. (1957; 1992)
- ROBERT A. JOHNSON, Colonel, Emeritus Professor of Electrical and Computer Engineering. B.S.E.E., M.S., and Ph.D., Clemson University; Professional Engineer. (1984; 1994)
- TAPPEY H. JONES, Colonel, Professor of Chemistry. B.S., Virginia Military Institute; Ph.D., University of North Carolina. (1993; 1997)
- DANIEL S. JOSEPH, Major, Assistant Professor of Mathematics. B.S., Virginia Military Institute; M.S., Ph.D., Virginia Polytechnic Institute and State University. (2004; 2004)
- ARNOLD W. JOYCE, Emeritus Professor of Physical Education. B.S., M.S., Springfield College; Dir. P.E., Indiana University; Ed.D., Virginia Polytechnic Institute and State University. (1966; 1983)
- CHAD A. JOYCE, Captain, Instructor in Physical Education. B.S., Springfield College; M.A., Old Dominion University.
- CLIFFORD KIRACOFE, Instructor of History. Ph.D., University of Virginia (2002; 2002)

* On leave, 2004-2005
 ** On leave, first semester 2004-2005
 *** On leave, second semester 2004-2005
 Y Taught first semester, 2004-2005
 YY Taught second semester, 2004-2005
 YYY Taught 2004-2005 (both semesters)

- BENJAMIN A. KLEINERMAN, Major, Assistant Professor of International Studies and Political Science. B.A., Kenyon College; Ph.D., Michigan State University. (2004)
- KEITH A. KLINE, Major, Assistant Professor of Psychology. B.S., Virginia Polytechnic Institute and State University. M.S., Ph.D., University of Tennessee. (2005; 2005)
- A. CASH KOENIGER, Colonel, Professor of History. A.B., Washington and Lee University; M.A., Ph.D., Vanderbilt University. (1986; 1990)
- KENNETH E. KOONS, Colonel, Professor of History. B.A., M.A., Shippensburg State College; D.A., Carnegie-Mellon University. (1982; 1992)
- JOHN G. LELAND, Colonel, Professor of English. B.A., M.A., Ph.D., University of North Carolina. (1986; 1993)
- RICHARD D. LEVY, Assistant Strength and Conditioning Coach. B.S., Springfield College.
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- DUNCAN J. RICHTER, Lieutenant Colonel, Associate Professor of Philosophy. B.A., Oxford University; M. Phil., University College of Swansea; Ph.D., University of Virginia. (1995; 1996)
- J. EDWARD RIESTER, Jr., Captain, Professor of Civil Engineering. B.S., Virginia Military Institute; M.S., Ph.D., Old Dominion University. Professional Engineer. (1993; 2001)
- STEVEN RIETHMILLER, Colonel, Professor of Chemistry and Holder of the John C. Allen '62 Institute Professorship in Chemistry. B.S., Virginia Military Institute; Ph.D., University of South Carolina. (1963; 1984)
- GARY K. ROGERS, Colonel, Professor of Civil Engineering. B.S., West Virginia Institute of Technology; M.E., University of California, Berkeley; Ph.D., Virginia Polytechnic and State University; Professional Engineer. (1993; 1997).
- GEORGE L. ROTH, JR., Colonel, Emeritus Professor of English. A.B., Franklin and Marshall College; M.A., Ph.D., Princeton University. (1951; 1988)
- RICHARD A. ROWE, Colonel, Professor of Biology, Head of the Biology Curricula, and Director of Research, VMI Research Laboratories, Inc. B.A., Ripon College; M.S., Bowling Green State University; Ph.D., Michigan State University. (1991; 1997)
- CHRISTOPHER B. RUSSELL, A.B., Dartmouth College; J.D., University of Notre Dame. (2002; 2002) P/T
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- R. WANE SCHNEITER, Colonel, Professor of Civil Engineering and holder of the Benjamin H. Powell, Jr., '36 Institute Professorship in Engineering. B.S., Ph.D., Utah State University; Professional Engineer (1990; 1998)
- HENRY D. SCHREIBER, Colonel, Professor and Head of Chemistry and Holder of the Beverly M. Read '41 Institute Professorship in Arts and Sciences. B.S., Lebanon Valley College; Ph.D., University of Wisconsin-Madison. (1976; 1986)
- TINNI B. SEN, Major, Assistant Professor of Economics and Business. B.S., M.S., Calcutta University; Ph.D., University of Mississippi. (2000; 2001)

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- ROSE MARY SHELDON, Colonel, Professor of History. B.A., Trenton State College; M.A., Hunter College; Ph.D., University of Michigan. (1993; 2000)
- TROY J. SIEMERS, Lieutenant Colonel, Associate Professor of Mathematics; B.S., M.S., Purdue University; Ph.D., University of Virginia. (1999; 2005)
- EDWARD C. SIMMEL, Instructor in Psychology. B.A., University of California-Berkeley; Ph.D., Washington State University. (2005; 2005) P/T
- H. RICHARD SKUTT, Colonel, Emeritus Professor of Electrical and Computer Engineering. B.S., M.S., Virginia Polytechnic Institute and State University; Ph.D., Worcester Polytechnic Institute; Professional Engineer. (1978; 1996)
- DONNAMARIE SMITH, Y'Y'Y, Instructor in Chemistry. B.S., Hatwick College; M.S., University of Virginia (1999; 1999) P/T
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- LEAH R. STANDS, Major, Assistant Professor of Biology. B.S., Ohio Northern University; Ph.D., Ohio State University. (2003; 2003)
- WILLIAM J. STOCKWELL, Colonel, Associate Dean for Administration and Planning and Professor of Physical Education. B.S., Springfield College; Ph.D., University of Virginia. (1975; 1991)
- KERWIN C. STOTZ, Colonel, Professor Emeritus of Electrical Engineering. B.E.E., M.E.E., Ph.D., Rensselaer Polytechnic Institute. Professional Engineer. (1980; 1985)
- JUDY C. STRANG, Y'Y'Y, Assistant Director of the Writing Center. B.A., M.A., College of William and Mary (1996; 1996) P/T
- GERALD A. "JAY" SULLIVAN, Major, Assistant Professor of Mechanical Engineering. B.S., University of Vermont; M.S., Ph.D., Rensselaer Polytechnic University. (2004; 2004)
- DONALD R. SUNNEN, **, Colonel, Professor of Modern Languages and Cultures. B.A., Lawrence University; M.A., University of Illinois; Ph.D., University of Illinois. (1990; 2001)
- FRED C. SWOPE, Colonel, Emeritus Professor of Biology. B.S., University of Maryland, Ph.D., Michigan State University. (1968; 1988)
- TIM SYKES, Captain. B.A., University of Rio Grande-Ohio; M.S., Ohio University (2005; 2005).
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- ARTHUR C. TAYLOR, JR., Colonel, Emeritus Professor of Mechanical Engineering. B.S., Virginia Military Institute; M.S., Ph.D., Ohio State University; Professional Engineer. (1949; 1989)
- SOE THAN, Colonel, Professor of Mathematics and Computer Science. B.S., Rangoon University; M.S., University of Lancaster; Ph.D., University of Kansas. (1995; 2001)
- ROGER C. THOMPSON, Lieutenant Colonel, Assistant Professor of English. B.A., M.A., Baylor University; Ph.D., Texas Christian University. (1999; 2005)
- PENNIE J. TICEN, Major, Assistant Professor of English. B.A., Mount Holyoke College; M.A., Ph.D., University of Massachusetts, Amherst (2003; 2003)
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- DAREN J. TIMMONS, Major, Assistant Professor of Chemistry. B.S., Duke University; Ph.D., Texas A&M University (2001; 2001)
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- GREGORY A. TOPASNA, Major, Assistant Professor of Physics. B.S., M.S., Ph.D., Virginia Polytechnic and State University. (2000; 2000)
- RICHARD S. TRANDEL, Colonel, Emeritus Professor of Mechanical Engineering. B.S., Virginia Military Institute; M.S., Virginia Polytechnic Institute and State University; Ph.D., University of Virginia; Professional Engineer. (1959; 2004)
- SPENCER C. TUCKER, Colonel, Professor of History and Holder of the John Biggs '30 Cincinnati Chair in Military History. B.A., Virginia Military Institute; M.A., Ph.D., University of North Carolina. (1997; 2004)
- BLAIR P. TURNER, Captain, Professor of History and Political Science and Holder of the Henry King Burgwyn, Boy Colonel of the Confederacy, Chair in Military History. B.A., St. Andrews Presbyterian College; M.A., Ph.D., University of Florida. (1982; 1991)
- JAMES E. TURNER, Colonel, Professor of Chemistry/Biology and Director of Undergraduate Research. B.A., Virginia Military Institute; M.S., University of Richmond; Ph.D., University of Tennessee (2000; 2000)
- BARBARAVAN KUIKEN, Instructor in Chemistry. B.S., M.S., Brigham Young University; Ph.D., University of Cincinnati (2001; 2001)
- BRUCE C. VANDERVORT, Colonel, Professor of History. B.A., University of Wisconsin; M.A., University of Cincinnati; Ph.D., University of Virginia. (1989; 1998)
- STACEY K. VARGAS, Lieutenant Colonel, Associate Professor of Physics. B.S., Wheeling Jesuit College; M.S., Ph.D., University of Connecticut (1996; 2002)
- HEATHER VOEGTLE, Dreyfus Fellow in Chemistry. B.S., Mercer University; Ph.D., University of South Carolina.
- ADAM C. VOLANT, Y'Y'Y, Director of Alumni Placement and Instructor in Philosophy/Psychology. B.A., Virginia Military Institute. (1998; 1998) P/T
- VONDA K. WALSH, Colonel, Professor of Mathematics. B.S., Clinch Valley College; M.S., Virginia Polytechnic Institute and State University; Ph.D., Medical College of Virginia. (1985; 1998)
- CLIFFORD T. WEST, JR., Colonel, Professor of Economics and Business. B.A., University of California, San Diego; M.B.A., University of Notre Dame; Ph.D., Indiana University. (1996; 1999)
- MARK F. WILKINSON, Colonel, Professor of History. M.A., Ph.D., University of Michigan (1992; 1998)
- HENRY G. WILLIAMS, JR., Professor Emeritus of Mathematics. B.S., Wake Forest University; M.A., Ph.D., Duke University. (1964; 2001)
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- BRADFORD WINEMAN, Instructor of History. M.A., Texas A&M University. (2002; 2002)
- E. BURWELL WINGFIELD, Colonel, Emeritus Professor of Biology. A.B., Transylvania College; M.A., Appalachian State University; Ph.D., Virginia Polytechnic Institute and State University. (1968; 1978)
- WAFI WINGFIELD, Y'Y'Y, Instructor in Chemistry. B.S., Al-Mougtansiriya University; M.S., University Abu-Beker Belkair (2002; 2002)
- KUEN-HUEI WU, Associate Professor of Political Science and Visiting Fulbright Scholar. Chinese Armed Forces General Staff College; Ph.D., Paris X University. (1998; 1998)
- FUMIKO YAMAGAMI, Instructor of Modern Languages and Cultures. B.A. Waseola University; M.S., Radford University. (1999; 1999) P/T
- EDWARD G. ZDINAK, Colonel, Emeritus Professor of Mathematics. B.S., M.S., Ph.D., University of Pittsburgh (1964; 1999)

* On leave, 2004-2005

** On leave, first semester 2004-2005

*** On leave, second semester 2004-2005

Y' Taught first semester, 2004-2005

Y'Y' Taught second semester, 2004-2005

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CHRISTOPHER J. BOOTH, Assistant Baseball Coach. B.A., Thomas More College.

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KEITH BRAXTON, Assistant Football Coach. B.A., Virginia Military Institute.

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CHRISTIAN HOFFMAN, Assistant Sports Information Director. B.S., Lee University.

JOHN HOFFMAN, Assistant Athletic Trainer. B.S., University of Wisconsin - Lacrosse; M.Ed., University of Virginia

MARLIN M. IKENBERRY, Head Baseball Coach. B.A., Virginia Military Institute.

DONALD KINZIE JAMISON, Colonel, Emeritus Professor of Civil Engineering and Assistant Director of Intercollegiate Athletics. B.S., Virginia Military Institute; M.S., University of California; Ph.D., University of Wisconsin; Professional Engineer. (1957; 1992) P/T

ETHAN J. JEROS, Assistant Football Coach. B.A., M.A., Marietta College.

THOMAS H. JONES, Affiliate Athletic Trainer. B.S., Hampden Sydney College; M.Ed., University of Virginia.

CHRISTOPHER E. MALONE, Assistant Football Coach. B.S., M.S., Virginia Polytechnic and State University.

JAMES W. MASON, Athletic Equipment Manager.

WILLIAM CALVIN McCOMBS, II, Head Football Coach. B.S., The Citadel; M.Ed., University of South Carolina.

WILLIAM CALVIN McCOMBS, III, Assistant Football Coach. B.S., United States Air Force Academy.

BILL NICHOLSON, Head Swimming and Diving Coach. B.A., SUNY New Paltz.

CRAIG JOHN ROBERTS, Assistant Men's Soccer Coach. B.A., M.A., Park University.

STEPHEN THOMAS ROSS, Major, Head Soccer Coach. B.A., Virginia Military Institute; B.S., University of Arkansas.

DAVID ZACHARY SCOTT, Assistant Track and Field Coach. B.A., Virginia Military Institute.

GREGORY J. SHOCKLEY, Assistant Football Coach. B.S., M.A., Virginia Polytechnic and State University.

KEITH M. SILCOX, Assistant Athletic Trainer. B.S., James Madison University; M.Ed., University of Virginia.

PAUL SPANGLER, Assistant Track and Field and Cross Country Coach. B.A., Alabama University; M.E., Florida State University.

NATHANIEL P. ST. LAURENT, Assistant Lacrosse Coach. B.S., Keuka College.

JAMES ASHTON THORP, First Sergeant, USA (Ret.) Rifle Coach.

DENNIS E. TONEY, Associate Athletic Director. B.A., Bridgewater College; M.Ed., University of Virginia; M.S., Ohio University.

JOHN SCOTT TRUDGEON, Head Wrestling Coach. B.A., College of William and Mary.

CLIFFORD J. WADE, Compliance Director. B.S., Miami University of Ohio; B.A., University of Maryland; M.S., Webster University.

DARRIN ARTHUR WEBB, Assistant Track and Field Coach. B.S., Syracuse University.

ANDREW WESTHOUSE, Athletic Ticket Manager. B.A., Dennison University.

RONALD L. WEEKS, Athletic Field Preparations.

JAMES H. WHITTEN, Associate Head Strength and Conditioning Coach. B.S., M.Ed., Virginia Polytechnic Institute and State University.

DANIEL W. WILLIS, Assistant Basketball Coach. B.S., Lenoir-Rhyne College; M.A., Western Carolina University.

**ASSIGNED OFFICERS AND NONCOMMISSIONED
OFFICERS OF THE UNITED STATES
ARMY, NAVY, MARINE CORPS, AND AIR FORCE
2005-2006**

ROBERT L. SUTHARD, Colonel, USA, Professor of Military Science and Leadership. B.A., Virginia Military Institute; M.S., George Washington University and The National Defense University.

JAMES O. TUBBS, Colonel, USAF, Professor of Aerospace Studies. B.S., U.S. Air Force Academy; M.B.A., University of Texas; M.S., National War College.

WILLIAM R. GRACE, Colonel, USMC, Professor of Naval Science. B.A., Texas A&M University.

JON-MICHAEL B. ARCHER, First Lieutenant, USAF, Assistant Professor of Aerospace Studies. B.S., Virginia Military Institute; M.S., Touro University International.

BRANDON A. BISSELL, CPT, USA, Assistant Professor of Military Science. B.A., Virginia Military Institute.

THOMAS A. BRASHEARS, Captain, USA, Assistant Professor of Military Science and Leadership. B.A., Virginia Military Institute.

KENNETH R. BROWN, Lieutenant, USN, Assistant Professor of Naval Science. B.A., Norwich University.

LANCE R. BURKE, Tsgt, USAF, NCOIC of GMC.

JON C. CECALUPO, Captain, USA, Assistant Professor of Military Science. B.S., West Virginia University.

LISA M. CHAMBERS, Staff Sergeant, USAF, NCO for Professional Officers Course Personnel, Aerospace Studies.

ROBERT J. COOK, Captain, USA, Assistant Professor of Military Science and Leadership. B.A., Methodist College.

DEAN M. DANAS, Major, USAF, Assistant Professor of Aerospace Studies. B.A., University of South Carolina.

TERRI L. DORN, Captain, USA, Assistant Professor of Military Science and Leadership. B.A., Louisiana State University.

JON A. DRAKE, Captain, USA, Assistant Professor of Military Science. M.S., University of Missouri-Rolla.

LAURA D. ENCKE, Lieutenant, USNR, Assistant Professor of Naval Science. B.A., Columbian School of Arts and Science.

JAMES R. FAISON, USNR, Assistant Professor of Naval Science. B.S., Old Dominion University.

KRISTIN L. GALLOWAY, Captain, USAF, Assistant Professor of Aerospace Studies. B.S., United States Air Force Academy; M.A., George Mason University.

JOSEPH R. GARAUX, Captain, USMC, Junior Marine Officer Instructor. B.A., The Ohio State University.

WILLIAM H. GOUDY, MSG, USA, Instructor in Military Science and Leadership.

CHAD A. HARDT, Lieutenant, USN, Assistant Professor of Naval Science. B.S., University of South Carolina.

JOHNNY R. HONAKER, Lieutenant, USAF, Assistant Professor of Aerospace Studies. B.S., Wayland Baptist.

JOSEPH M. IRBY, LTC, USA, Assistant Professor of Military Science and Leadership. B.A., Virginia Military Institute.

MICHAEL S. JOHNSON, Gunnery Sergeant, Assistant Marine Officer Instructor.

TABITHA L. JONES, Staff Sergeant, USAF, NCOIC of Information Management, Aerospace Studies.

DARYL J. LANINGA, Major, USMC, Marine Officer Instructor. B.A., University of Michigan.

RANDY B. MARAJ, Major, USAF, Assistant Professor of Aerospace Studies. B.S., M.S., University of Oklahoma.

RAYMOND W. MARSH, Major, USAF, Assistant Professor of Aerospace Studies. B.S., Virginia Military Institute; M.S., University of Colorado.

MARK G. MARTIN, Commander, USN, Executive Officer and Assistant Professor of Naval Science. B.S., University of Wisconsin-LaCrosse; M.A., Naval Post Graduate School, Monterey.

JAMES E. PERDUE, MSG, USA, Assistant Professor of Military Science.

NORMAN J. PLUMMER, MSG, USA, Training and Operations NCO.

MARK J. STEEBER, SKC, USN, Supply Officer.

RANDOLPH D. THORNTON, MSG, USA, Instructor in Military Science and Leadership.

JOHN J. WRANEK, III, Major, USA, Assistant Professor of Military Science and Leadership. B.A., Virginia Military Institute.

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 12,550 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 Institute life, 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 2004-2005 are:

President:

Robert B. Newman, Jr. '73 Richmond, Virginia

First Vice-President

James F. Spellman, Jr. '85 Eastchester, New York

Second Vice-President

Richmond P. Lykins, Jr. '73 Germantown, Tennessee

Historian:

Thomas W. Davis '64 Lexington, Virginia

Executive Vice-President:

Paul B. Maini '66 Lexington, Virginia

Vice President – Moody Hall and Alumni Activities:

Carole B. Green Lexington, Virginia

Vice President – Alumni Placement

Adam C. Volant, SPHR '88 Lexington, Virginia

Vice President – Chapter Activities

Dallas B. Clark '99 Lexington, Virginia

New Cadet Recruiting Coordinator

Kennon W. Kincaid '03 Lexington, Virginia

Administrative Assistant

Louella Allen Lexington, Virginia

Administrative Assistant

Connie E. Loughhead Lexington, Virginia

VMI ALUMNI REVIEW:

Editor and Vice President:

Kathryn A. Wise Lexington, Virginia

Associate Editor

Hope L. Hennessey 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.vmikeydets.com.

The 2005-2007 officers are:

President:

James H. Chapman, III '69 Salem, Virginia

First Vice-President:

William H. Stephens, Jr. '73 Midlothian, Virginia

Second Vice-President

Daryl L. Deke '82 Newport Beach, California

Secretary/Treasurer

Charles L. Plageman '90 Richmond, Virginia

Executive Vice-President:

Gregory M. Cavallaro '84 Lexington, Virginia

Vice President:

Donald S. Ross '74 Lexington, Virginia

Assistant Vice-President

Susan M. Wood Glasgow, Virginia

Administrative Assistant

Jennifer M. Palmer Lexington, 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 more than one third of the Institute's budget.

Officers and primary staff for 2004-2005 are:

President:

George P. Ramsey III '72 Lynchburg, Virginia

Vice President/Fund Raising:

Walter C. Perrin II '62 Atlanta, Georgia

Vice President/Administration:

J. Robert Philpott, Jr. '68 Charlotte, North Carolina

Executive Vice President:

James L. Adams '71 Lexington, Virginia

Vice President:

Warren J. Bryan, '71 Lexington, Virginia

Vice President and Chief Financial Officer:

David L. Prasnicki Lexington, Virginia

Director of Foundation Relations:

Scott E. Belliveau '83 Lexington, Virginia

Director of Information Services:

Patrick J. Costa Fincastle, Virginia

Vice President:

Douglas E. Taylor Lexington, Virginia

Director of Alumni and Reunion Giving:

Patrick F. Webb Lexington, Virginia

Director of Non-Alumni Giving:

Terrie I. Conrad Appomattox, Virginia

Corporate Secretary:

Frances W. Arehart Lexington, 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, speakers
- Chaplain's program
- Clubs and club sports
- Rat Challenge
- Cadet awards
- Cadet investment group
- Barracks technology enhancements

FACULTY

- Institute professorships
- Visiting scholars program
- Professional development
- Research
- Supplemental retirement
- Housing subsidies
- Professional development leaves
- Teaching and service awards
- Departmental funds
- Technology upgrades

ADMINISTRATION

- Admissions
- Public relations
- Capital improvements
- Property maintenance

ALUMNI

- VMI Association and chapter support
- Alumni Placement Office
- New cadet recruiting
- VMI *Alumni Review*
- Moody Hall
- Class agents

OTHER

- VMI Museum
- Chessie Nature Trail
- 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 Major General C. Ernest Edgar, III of Atlanta, Georgia, and the Director of Research is Dr. Richard A. Rowe, Professor of Biology. During 2003-2004 ten faculty members and several cadets were employed part-time on contracts totaling in excess of \$1,370,000 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 2003-2004, 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 2004 GRADUATES BY CURRICULUM

	Number Graduates	Distinguished Graduates
Biology	8	2
Chemistry	4	1
Civil Engineering	27	2
Computer Science	10	1
Economics-Business	40	4
Electrical Engineering	7	1
English	12	0
History	38	1
International Studies	26	10
Mathematics	4	0
Mechanical Engineering	31	2
Modern Languages	1	0
Physics	5	2
Psychology	19	0

RECAPITULATION OF GRADUATES

Total to September 15, 2003	18,547
Graduated in 03-04 session	282
Total to September 15, 2004	18,829

ENROLLMENT SUMMARY FALL 2004

(First Semester)

Opening enrollment for the 2004-2005 session included matriculation of 421 new cadets and registration of 972 old cadets. Under guidelines of the State Council of Higher Education for Virginia, the figures below represent Corps strength (1362) as of the drop-add census date, September 9, 2004.

CLASS OF	2005	2006	2007	2008	TOTAL
Old Female Cadets	13	15	29	0	57
Old Male Cadets	301	293	321	0	915
New Female Cadets	0	0	0	25	25
New Male Cadets	0	0	0	365	365
Total Female Cadets	13	15	29	25	82
Total Male Cadets	301	293	321	365	1280
Total Cadets	314	308	350	390	1362

CLASS OF	2005	2006	2007	2008	TOTAL
Biology	25	19	26	24	94
Chemistry	10	7	9	6	32
Civil Engineering	25	27	33	43	128
Computer Science	10	6	6	11	33
Economics/Business	52	38	72	62	224
Electrical Engineering	9	11	15	12	47
English	9	10	16	2	37
History	62	42	42	62	208
History/Int'l Studies Interest	0	21	58	0	79
International Studies	33	36	1	63	133
Mathematics	5	4	1	2	12
Mechanical Engineering	29	39	45	74	187
Modern Languages & Cultures ...	8	8	2	3	21
Physics	4	4	3	6	17
Psychology	33	36	21	20	110
TOTAL	314	308	350	390	1362

Total Enrollment For Session On Census Dates:

Old Cadets in August	972
in January	13
New Cadets in August	390
in January	0
TOTAL	1375

GEOGRAPHICAL DISTRIBUTION

CORPS OF CADETS – FALL 2004

(Based on state of legal residence)

Legal Residence	2005	2006	2007	2008	Total
Alabama	2	1	0	2	5
Alaska	0	1	1	0	2
Arizona	0	0	1	2	3
Arkansas	0	1	2	0	3
California	4	8	7	8	27
Colorado	0	1	1	1	3
Connecticut	3	2	1	5	11
Delaware	0	3	0	0	3
District of Columbia	1	1	0	1	3
Florida	4	6	15	10	35
Georgia	9	6	5	4	24
Hawaii	0	1	0	0	1
Idaho	1	0	0	1	2
Illinois	3	11	2	5	21
Indiana	2	4	6	1	13
Iowa	0	1	0	0	1
Kansas	1	2	0	1	4
Kentucky	2	2	0	0	4
Louisiana	1	1	0	1	3
Maine	0	2	1	2	5
Maryland	16	14	9	23	62
Massachusetts	1	4	7	3	15
Michigan	4	4	5	4	17
Minnesota	3	2	1	1	7
Mississippi	0	0	1	1	2
Missouri	0	0	2	0	2
Nebraska	0	0	1	1	2
Nevada	0	1	1	0	2
New Hampshire	1	1	2	1	5
New Jersey	11	3	11	13	38
New Mexico	1	0	0	1	2
New York	5	11	10	19	45

Legal Residence	2005	2006	2007	2008	Total
North Carolina	10	11	18	15	58
Ohio	10	8	6	8	32
Oregon	1	0	1	0	2
Pennsylvania	14	13	24	19	70
Rhode Island	1	1	0	0	2
South Carolina	1	3	2	3	9
South Dakota	0	0	0	1	1
Tennessee	3	3	3	4	13
Texas	9	5	10	7	31
Utah	2	1	0	0	3
Virginia	170	161	179	207	717
Washington	0	0	1	0	1
West Virginia	5	2	1	7	15
Wisconsin	0	0	1	0	1
Wyoming	0	0	2	1	3
Canada	0	0	0	1	1
Republic of China	1	0	1	0	2
Egypt	0	0	1	0	1
Greece	2	0	0	0	2
Hong Kong	2	0	0	0	2
Kenya	0	0	1	1	2
Lithuania	0	2	0	0	2
Mexico	1	0	0	0	1
Poland	0	0	0	1	1
Russia	1	0	1	0	2
Taiwan	4	3	4	4	15
Thailand	2	1	2	0	5
TOTAL:	314	308	350	390	1362

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