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Encl: (1) References
(2) Majors Handbook and Course Catalog

1. Purpose. To publish the Majors Handbook, enclosure (2).
2. Cancellation. Provost Instruction 1537.87A
3. Information. The Majors Handbook contains general information on the USNA Academic Program effective Fall 2023 (Academic Year 24). Every effort has been made to ensure its accuracy at the time of publishing, but USNA reserves the right to make corrections and changes to any information contained in this and subsequent issues of this Handbook. This Handbook references several Provost and USNA Instructions enclosure (1). For detailed information on particular policies and procedures you should consult the original referenced instruction.
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 - b. For questions concerning the management of records related to this instruction or the records disposition schedules, please contact your local records custodian or the USNA Records Manager.
5. Review and Effective Date. Per OPNAVINST 5215.71A, the Associate Provost for Academic Affairs will review this instruction annually on the anniversary of the effective date to ensure applicability, currency, and consistency with Federal, DoD, SECNAV, and Navy policy and statutory authority using OPNAV 5215/40 Review of Instruction.

14 Aug 2023



S.L. FIREBAUGH

Releasability and distribution:

This instruction is cleared for public release and is available electronically only via the USNA Issuance Website, <https://www.usna.edu/AdminSupport/Inst/>

REFERENCES

- (a) USNAINST 1531.49C
- (b) PROVOSTINST 5700.1E
- (c) PROVOSTINST 1531.59C
- (d) ACDEANINST 1531.61A
- (e) PROVOSTINST 1531.60B
- (f) USNAINST 1531.51B
- (g) ACDEANINST 1531.77A
- (h) ACDEANINST 1531.68C
- (i) USNAINST 1531.47D
- (j) USNAINST 1520.2AB
- (k) PROVOSTINST 1531.69A
- (l) ACDEANINST 1531.79B
- (m) ACDEANINST 5420.4E
- (n) USNAINST 1531.34D
- (o) PROVOSTINST 5700.1E
- (p) PROVOSTINST 5700.2I
- (q) USNAINST 5420.24G
- (r) USNAINST 1610.3M
- (s) USNAINST 1531.53D

THE MAJORS HANDBOOK & COURSE CATALOG

ACADEMIC YEAR 2024



UNITED STATES
NAVAL ACADEMY

A n n a p o l i s

Message from the Provost

Your journey in service to your country leads through Annapolis and the United States Naval Academy; but this is not your destination. This is a time for you to prepare for what comes next. We want you to dedicate your best efforts here in Annapolis to develop yourself morally, mentally and physically for the privilege of leading sailors and Marines. That developmental process includes completing the requirements for a baccalaureate degree in an academic program focused on the needs of the Navy and Marine Corps. We are confident that you will find this academic program challenging and stimulating. Some of you may experience temporary setbacks. Try to see those setbacks as opportunities for growth. Do not give up, and do not be satisfied with achieving the minimum requirement. The Naval Academy is all about striving for excellence. The faculty and staff assembled here are ready to help you succeed and, if you are willing to work hard enough, they will help you achieve your best, even in the most challenging aspects of the program.

The Majors Handbook contains general information on the USNA Academic Program effective Fall 2023 (Academic Year 23-24). Every effort has been made to ensure its accuracy, but USNA reserves the right to make corrections and changes to any information contained in this and subsequent issues of this Handbook. This Handbook references several Provost and USNA Instructions. For detailed information on particular policies and procedures you should consult the original referenced instruction.

The Majors Handbook is one of the many resources designed to help you achieve success in the academic part of your four-year developmental process. I encourage you to become familiar with its contents and freely consult the faculty and staff to whom it may lead you. Responsibility for academic success ultimately rests with each midshipman. Take on that responsibility as a personal challenge. Make the most of your time, strive for excellence rather than mediocrity, and employ all the resources we will provide you to prepare yourself for the great honor and adventure represented by service to your country as an officer in the Navy or Marine Corps.

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The Mission

The mission of the United States Naval Academy is to develop Midshipmen morally, mentally, and physically and imbue them with the highest ideals of duty, honor, and loyalty in order to graduate leaders who are dedicated to a career of Naval service and have potential for future development in mind and character to assume the highest responsibilities of command, citizenship, and government.

The United States Naval Academy is both a university and a Navy command, with the purpose of commissioning junior officers into the U.S. Navy and Marine Corps. This unique and challenging environment provides an outstanding academic program, demanding physical requirements, and professional military training to develop midshipmen morally, mentally, and physically into junior officers ready to serve the nation.

We believe that high academic standards and a challenging educational program can coexist within a positive and engaging learning environment. You can find more about the strategic vision of our academic program in our [Master Academic Plan](#).

Academic Organization

The principal responsibility for directing the Naval Academy is vested in the Superintendent. The Superintendent is assisted by two principals, the Provost and the Commandant of Midshipmen. The Provost is the chief academic officer who supervises the academic curriculum and faculty, and sets the goals to achieve academic standards. The Commandant of Midshipmen is responsible for the execution of military and physical training, and the command administration of the Brigade of Midshipmen.

The Academic Dean and Provost Office

The Provost is assisted by the Vice Provost, and three Associate Provosts. Their offices are in Nimitz, adjacent to the Library lobby. More information on the Provost Office can be found at: <https://www.usna.edu/Academics/Provost/>

Schools, Divisions and Majors

The academic and professional departments of the Naval Academy are divided into Schools or Divisions, which are analogous to the individual colleges found at civilian universities. These are the School of Engineering and Weapons, the School of Mathematics and Science, the School of Humanities and Social Sciences, the Division of Professional Development, and the Division of Leadership Education and Development. The Schools are under the Provost, while the Divisions are in the Commandant's chain of command and have additional military training functions outside of academic classes.

Academic departments are housed within each School or Division and such academic units are led by departmental chairs. Departmental chairs are appointed by the Provost, in consultation with the faculty of the department, and may be civilian professors or military officers.

There are five Schools or Divisions at the Academy. They are:

- The School of Engineering and Weapons;
- The School of Mathematics and Science;
- The School of Humanities and Social Sciences;
- The Division of Professional Development; and
- The Division of Leadership Education and Development (LEAD); and

Midshipmen choose a major in the second semester of plebe year. Plebe year is approximately the same for all midshipmen, as will be explained later in this chapter. Listed below are the schools, departments, majors offered, location and contact information. As you will note, the Professional Development and LEAD divisions do not currently offer majors.

School of Engineering and Weapons - Departments and Majors

Department	Major(s)
Aerospace Engineering	Aerospace Engineering
Electrical and Computer Engineering	Electrical Engineering Computer Engineering
Mechanical and Nuclear Engineering	Mechanical Engineering Nuclear Engineering General Engineering
Naval Architecture and Ocean Engineering (NAOE)	Naval Architecture & Marine Engineering Ocean Engineering
Weapons, Robotics, and Control Engineering	Robotics & Control Engineering

School of Humanities and Social Sciences - Departments and Majors

Department	Major(s)
Economics	Quantitative Economics
English	English
History	History
Languages and Cultures*	Arabic Chinese Foreign Area Studies
Political Science	Political Science
* In addition to the three majors listed, the Languages and Cultures Department offers minors in seven languages: Arabic, Chinese, French, German, Japanese, Russian, and Spanish.	

School of Mathematics and Science - Departments and Majors

Department	Major(s)
Chemistry	Chemistry
Computer Science	Computer Science Data Science Information Technology*
Cyber Science	Cyber Operations
Mathematics	Mathematics Operations Research Mathematics with Economics General Science
Ocean and Atmospheric Sciences	Oceanography
Physics	Physics

*not offered to the Class of 2025 and beyond

Division of Professional Development

Department
Officer Accessions and Talent Optimization
Seamanship and Navigation
Waterfront Readiness
Sailing
Training

Division of Leadership Education and Development (LEAD)

Department
Leadership, Ethics, and Law
Center for Experiential Leadership Development

Additional Academic Offices

Physical Education Department

For matters related to Physical Education courses, midshipmen should contact the Marking Officer, who could normally be found in MacDonough Hall (while MacDonough is undergoing renovation, the Marking Office will be located on the Ground Floor of Nimitz).

Registrar's Office

The Registrar's Office provides services related to verification of attendance, enrollment, and degrees; transcripts; grade collection and reporting; and academic scheduling. The office is located on the ground floor of Nimitz. For more information see: <https://www.usna.edu/Registrar/>

Student Academic Development Office

The Student Academic Development Office provides specialized advising services and student support. It is located on the second floor of Nimitz Library.

The Class of 1963 Center for Academic Excellence (CAE)

The Class of 1963 Center for Academic Excellence offers academic support programs for all midshipmen seeking to improve their academic performance. For information on their services, see: <https://intranet.usna.edu/AcCenter/>

Accreditation

The United States Naval Academy is accredited by the Middle States Commission on Higher Education (MSCHE). MSCHE is an institutional accrediting agency recognized by the U.S. Secretary of Education and the Council for Higher Education Accreditation (CHEA). Information is available at msche.org or Middle States can be contacted communications@msche.org or via USPS at 1007 North Orange Street; 4th Floor, MB #166; Wilmington, DE 19801.

USNA also has programmatic accreditation in a number of areas. The Chemistry major is accredited by the American Chemical Society. The following engineering programs are accredited by the Engineering Accreditation Commission (EAC) of ABET, Inc., abet.org: Aerospace Engineering, Computer Engineering, Electrical Engineering, General Engineering, Mechanical Engineering, Naval Architecture and Marine Engineering, Nuclear Engineering, Ocean Engineering, and Robotics and Control Engineering. The Computer Science, Cyber Operations, and Information Technology programs are accredited by the Computing Accreditation Commission (CAC) of ABET, Inc., <http://www.abet.org>.

Additionally the Cyber Operations program has been granted National Security Agency (NSA) designation as a Center of Academic Excellence in Cyber Operations (CAE-CO).

Curriculum

The Naval Academy curriculum is designed to provide midshipmen the knowledge and skills necessary to perform the duties of a junior officer in the United States Navy or United States Marine Corps.

All midshipmen are given a broad education in mathematics, science, engineering, the social sciences, and the humanities. In addition, the curriculum prepares midshipmen with a background in leadership, ethics, military law and customs, seamanship, navigation, tactics, and weaponry. A midshipman's major adds further educational depth in a specific field of interest, and upon completion of all requirements, a Bachelor of Science degree in the designated major is awarded.

Degree Requirements

As specified in [USNAINST 1531.49C](#), a midshipman at the U.S. Naval Academy must satisfy the following requirements in order to graduate and receive a degree:

1. Complete or validate a minimum of 137 semester hours, including a minimum of 90 semester hours in the core program, with a cumulative quality point rating (CQPR) of at least 2.00.
2. Complete or validate the required core, divisional, and majors courses specified in the matrix for the assigned major. Matrices are prepared and revised by the cognizant academic departments and approved by the Executive Steering Committee.
3. Achieve the required standards of performance in:
 - a. Military performance
 - b. Honor
 - c. Conduct
 - d. Physical Education
4. Achieve the required standards of performance in the prescribed summer training for each of the four years.
5. Accept a commission in the U.S. Navy or U.S. Marine Corps; or in certain exceptional cases, agreed upon by the Department of the Navy and the Department of the Army or the Air Force, a commission in the U.S. Army or the U.S. Air Force.

Midshipmen who meet the requirements above and achieve a CQPR of at least 2.0 in all courses required for completion of the major's portion of the assigned major matrix will receive a Bachelor of Science in <MAJOR> degree. Those who meet the requirements but do not achieve a 2.0 in the major's portion will earn a Bachelor of Science degree with no designation.

Midshipmen who complete the honors program in Applied Mathematics, English, History, Mathematics, Naval Architecture and Marine Engineering, Ocean Engineering, Oceanography, Operations Research, Physics, Political Science, Quantitative Economics, or Robotics and Control Engineering earn a Bachelor of Science degree with honors.

The Naval Academy does not normally award a degree and a commission separately. Ordinarily, both or neither are granted. Moreover, the academic degree will not normally be awarded if a midshipman fails to meet the standards of performance in a non-academic area.

Core Requirements

Every midshipman must complete a set of “core” courses that are designed to prepare them for any service assignment community. The core constitutes about $\frac{2}{3}$ of every midshipman’s academic program.

Chemistry

Midshipmen are required to complete one year of basic chemistry. Midshipmen will normally take SC111 and SC112 (Foundations of Chemistry I and II) during plebe year. Students who validate one semester of chemistry may either be assigned to SC151 (Modern Chemistry) in the fall semester of plebe year or SC112 in the spring semester of plebe year. Passing either SC112 or SC151 will complete the requirement of one year of basic chemistry for a midshipman who validates SC111.

Cyber

Introduction to Cyber Security, SY110, is taken during plebe year by all midshipmen. In addition, Applications of Cyber Engineering, EC310, is required of all majors except Computer Engineering, Computer Science, Cyber Operations, Electrical Engineering, Information Technology and Robotics and Control Engineering. For Robotics and Control Engineering majors, EC312 is required.

Engineering

Midshipmen who chose a major in either the School of Mathematics and Science or the School of Humanities and Social Sciences must complete two courses in naval engineering. These are EA/N4XY (EA400 Introduction to Aeronautics, EN400 Principles of Ship Performance, or EN401 Engineering in the Littoral Zone) and EM300 (Principles of Ship Propulsion). Engineering and Weapons majors are not required to take these courses because the engineering concepts in these courses are also found in their majors courses.

The core program also contains electrical engineering, applications of cyber engineering, and engineering control systems courses. The particular courses that are required vary somewhat from one group of majors to another, and the specific requirements can be found on the Provost’s website and in the MIDS module.

English

All midshipmen are required to validate or complete a two-course sequence in English: HE111, Rhetoric and Introduction to Literature I, and HE112, Rhetoric and Introduction to Literature II. In addition, some midshipmen, in need of greater preparation, may also be required to take HE101, Practical Writing. If HE101 is required, HE111W will be taken in the second term of Fourth Class year, and HE112W will be taken in the first term of Third Class year. HH2XY and HH216 should then be taken without delay following the completion of HE112. HE101 substitutes for a 200-level humanities or social science elective in all majors. International students will be placed in classes appropriate to their general fluency with English.

Government

The course U.S. Government and Constitutional Development (FP130) is required.

History

Midshipmen must complete the history course HH104, American Naval History, and a two- course sequence in world history, HH2XY (HH215 The West in the Pre-Modern World, HH215A Asia in the Pre-Modern World, or HH215M The Middle East in the Pre-Modern World) and HH216 (The West in the Modern World).

Humanities and Social Sciences

A total of 24 credits of humanities or social sciences courses are required in the core program for all majors. These include the following courses: HE111, HE112, HH104, HH2XY, HH216, and FP130. Two additional humanities or social science electives are required. At least one shall be at the 300/400 level (HM SS2). HE101 may be one of the two, if HE111 and HE112 are also taken.

For STEM majors the language course FL101 may count for the lower level humanities social science elective and the FL102 course may count for the upper level humanities or social science requirement only where L will be subsequently replaced by the identifier A (Arabic), C (Chinese), J (Japanese), or R (Russian).

Humanities and social science courses are taught by the departments of Economics (courses with the FE designator, excluding FE220 Accounting, but not those courses with the SE designator), English (HE designator), History (HH designator), Political Science (FP designator), Languages and Cultures (FA, FC, FF, FG, FJ, FL, FR, and FS designators), and a selected list of courses taught by Leadership, Ethics, and Law (NL and NP designators). Midshipmen in the Quantitative Economics major may not fulfill the core requirements in humanities and social sciences with economics courses.

For all majors, the language courses FL101 and FL102 will not count for the lower-level humanities or social science elective where L is replaced by the identifier F (French), G (German) or S (Spanish). FE220 (Accounting) and courses with fewer than three credit hours cannot be used as humanities or social science electives. NL or NP courses that have an “N” (NL285N) have not been approved as a HMSS.

Languages

Non-STEM majors must complete or validate a minimum of four semesters of one foreign language from the following: Arabic, Chinese, French, German, Japanese, Spanish, or Russian.

Entry into the Arabic, Chinese, Russian, or Japanese sequences is subject to an academic review and assessment by the Languages and Cultures Department. For students with prior exposure to a language, only up to two semesters can be validated. Language ability beyond that is reflected by placement at the appropriate language level.

Mathematics

Midshipmen are required to complete three semesters of calculus, and either a course in differential equations, or one in probability, or one in data science. Precalculus mathematics (SM005) may be prescribed as a preparatory course, and can be used as a free elective (in majors with a free elective).

Calculus III has two options that are designed to complement certain majors. SM221 is multivariate calculus and includes a study of vector fields and the vector integral theorems of Gauss and Stokes. It is taken by all engineering majors, as well as Applied Physics, Mathematics, Oceanography, and Physics majors. SM223 is also multivariate calculus, but includes a study of optimization using Lagrange multiplier methods and is normally taken by all humanities and social science majors as well as Chemistry, Computer Science, Cyber Operations, General Science, and Operations Research majors.

Physical Education

All midshipmen must complete physical education courses in each of the eight semesters at the Naval Academy. Requirements include running, swimming, applied strength, personal combat skills, and tests of physical fitness. While grades in these courses are not part of a midshipman's academic grade point average, they do enter into the computation of a midshipman's class standing, and the Order of Merit.

Physics

All midshipmen are required to complete a year of physics during their third class year. The normal course sequence that satisfies this requirement is General Physics I & II (SP211, SP212). Physics Majors will take a three course sequence: Mechanics I (SP221); Electricity and Magnetism I (SP222); and Heat, Sound, and Light (SP226). Additionally, Calculus III is a co-requisite for SP211 and SP221.

The following sequences meet the core requirements in physics:

SP211 and SP212, or

SP221 and SP212, or

SP211 and SP222 and SP226, or

SP221 and SP222 and SP226

The paired courses SP221/SP222 and SP211/SP222 do not cover core physics and are not acceptable without SP226. A transfer from SP222 to SP212 will not be permitted after the fourth week of the term.

Professional Courses

All midshipmen are required to take two Naval Science courses (NS101 and the capstone professional course NS43X), two Navigation courses (NN220 and NS300), two Leadership courses (NL110 and NL310), an Ethics course (NE203), and a Law course (NL400). The class of 2025 and earlier are required

Writing

All courses taught at the Naval Academy are expected to involve writing by midshipmen. The ability to communicate effectively both orally and verbally is expected of well-educated people and is essential in a naval officer. Each major should have a capstone course that requires a significant amount of writing. In the core, the four courses HE111, HE112, HH2XY, and HH216 are regarded as a unit with respect to the development of writing skills. At the end of HH2XY or HH216, instructors teaching those courses are asked to assess the writing of their midshipmen. The writing of those regarded as deficient is referred to the English Department for further evaluation. Some of these midshipmen may be required to take Professional Writing (HE344) and the Practical Writing Laboratory (HE044) to improve their writing skills (HE388 is the summer school equivalent to HE344 + HE044).

The Plebe Year

The course requirements for most midshipmen are the same in their first (fourth class or plebe) year at the Naval Academy. The courses taken in this year are part of the core program. The table below summarizes the courses typically taken in the Plebe (or 4/C) year.

Fall Semester	Spring Semester
Mathematics One of the following is required: SM005 (4-0-4). Pre-Calculus Mathematics SM121 (4-0-4). Calculus I	Mathematics One of the following sequels is required: SM121A (4-1-4). Calculus I SM122 (4-0-4). Calculus II SM122 (4-0-4). Calculus II
Chemistry One of the following is required. SC111 (3-2-4). Foundations of Chemistry I SC151 (3-2-4). Modern Chemistry	Chemistry The following sequel is required. SC112 (3-2-4). Foundations of Chemistry II A course to be determined with adviser
English One of the following is required: HE101 (3-0-3). Practical Writing HE111 (3-0-3). Rhetoric and Intro to Literature I HE111S (3-0-3). Rhetoric and Intro to Literature I	English One of the following sequels is required: HE111W (3-0-3). Rhetoric and Intro to Literature I HE112 (3-0-3). Rhetoric and Intro to Literature II HE112S (3-0-3). Rhetoric and Intro to Literature II
Government* The following course is required: FP130 (3-0-3). U.S. Gov't and Constitutional Development	Naval History* The following course is required: HH104 (3-0-3). American Naval History
Cyber Security* The following course is required: SY110 (2-2-3). Introduction to Cyber Security	Leadership* The following course is required: NL110 (2-0-2). Preparing to Lead
	Seamanship* The following course is required: NS101 (1-2-2). Introduction to Seamanship

* These courses might be taken either in fall or spring

Majors

USNA offers the following majors and major tracks, listed with their code in the Midshipman Information System.

School of Engineering and Weapons

Aerospace Engineering	
Aeronautics	EAS
Astronautics	EASA
Computer Engineering	ECE
Electrical Engineering	EEE
General Engineering	EGE
Mechanical Engineering	EME
Naval Architecture and Marine Engineering	ENM
Naval Architecture and Marine Engineering with Honors	ENMH
Nuclear Engineering	ENR
Ocean Engineering	EOE
Ocean Engineering with Honors	EOEH
Robotics and Control Engineering	ERC
Robotics and Control Engineering with Honors	ERCH

School of Mathematics and Science

Chemistry	SCH
Biochemistry	SCB
Computer Science	SCS
Cyber Operations	SCY
NSA CAE-CO Track	SCYN
Data Science	SDS
General Science	SGS
Information Technology	SIT (not available beyond 2024)
Mathematics	SMA
Mathematics with Honors	SMAH
Applied Mathematics	SMP
Applied Mathematics with Honors	SMPH
Mathematics with Economics	SME
Ocean and Atmospheric Sciences	SOC
Oceanography with Honors	SOCH
Operations Research	SMO
Operations Research with Honors	SMOH
Physics	SPH
Physics with Honors	SPHH
Applied Physics	SPA
Astrophysics	SPAA

School of Humanities and Social Sciences

Arabic	FLA
Chinese	FLC
Foreign Area Studies	FAS
Foreign Area Studies - Asia	FASA
Foreign Area Studies - Middle East	FASM
English	HEG
English with Honors	HEGH
History	HHS
History with Honors	HHSB
Political Science	FPS
Political Science with Honors	FPSH
Quantitative Economics	FQE
Quantitative Economics with Honors	FQEH

Minors, LREC, and Dual Majors

Language Minors

Minors are available in all seven languages and are noted on the transcripts of those who complete the requirements. No other minors exist. Minors in all languages can be completed within a three-year period, starting at the 100 level, by all midshipmen with adequate space in their matrix who place at that level. [ACDEANINST 1531.9](#) describes the Language Minor Policy.

The following minor requirements are in place:

- a. The minor will require a minimum of six courses (18 credits). A midshipman must have an average grade of 3.0 in the 18 credit hours of target language classes designated to earn the minor.
- b. Through language placement any midshipman can alleviate a maximum of two courses (six credits) toward the minor. For example, a student who places at or above the 200 level of Spanish will be able to use six credits toward the minor. That student shall take an additional 12 credits (four courses) during the course of a career at USNA with a minimum 3.0 average to complete the minor.
- c. Students pursuing the minor will be placed at the appropriate initial level of study according to assessments upon arrival at USNA. Candidates for the minor will be required to begin the minor at the level in which they are placed.
- d. It is possible that language immersion programs, such as SSA (Semester Study Abroad), LSAP (Language Study Abroad) or language-intensive summer programs for STEM majors, all vetted by professors in the Languages and Cultures Department, or the Critical Language Scholarship program (CLS) may alleviate one but no more than two additional courses, or six credits. For example, a student who participates in Semester Study Abroad to Morocco and validates three Arabic courses upon his or her return, may only apply two of these courses towards a minor.
- e. In all cases, a minimum of two language courses (six credits) must be taken in residence at USNA, with a 3.0 QPR, in order to complete a language minor.

Language Proficiency, Regional Expertise, Cultural Awareness (LREC)

Individual cultural abroad programs must be vetted by the department where they originate. The program may be designated either for or not for credit. The maximum credits associated with an overseas cultural opportunity will be three credits. As with any experimental course, before being offered for the third time a for-credit cultural opportunity should be approved by the Senate Curriculum Committee. All midshipmen must be enrolled in at least 15 credits in addition to the one-credit overseas experience in case of the course's cancellation. All overseas cultural programs should maximize extended contact with the local population.

For-credit programs must contain pre-trip orientation sessions and include a rubric for assessment of the overseas experience. This assessment must be based on the evaluation of the academic objectives. It cannot be limited to self-assessment by midshipmen or midshipmen evaluation of component parts of the trip. Assessment for non-credit courses is also recommended.

More information on Language Study Abroad Program Guidelines can be found in [PROVOSTINST 5700.1E](#).

Dual Majors

To be awarded a second major, a midshipman must complete all the requirements in both majors. In the major course category of the second major, at least five of the courses, totaling a minimum of 15 semester credit hours, must be taken above and beyond the requirements of the primary major (typically, these appear below-the-line in the primary matrix). At least four of these five courses must be at the 300 level or above. The completion of a second major does not constitute eligibility for a second degree, but both majors will be noted on official transcripts and the diploma. It is imperative that a midshipman attempting a dual major does not do so at the expense of the first major. A midshipman will not be permitted to fall behind his first major in pursuit of a second major.

A midshipman is automatically assigned an academic adviser for the primary major. Those who pursue a second major must report the intention to pursue the second major to the department concerned and may request an additional adviser in the second field (which is typically the SAA for the second major). The Chair or SAA for the second major must notify the Registrar of the student's intention to pursue a double major.

General Engineering will not be a second major for midshipmen who complete another engineering major. General Science will not be a second major for midshipmen who complete another major in mathematics or science.

More information on dual majors can be found in [PROVOSTINST 1531.59C](#).

Capstone and Capstone Day

Most majors require a "capstone" course, paper, or project in the first-class year. The capstone is the culminating academic experience for students at USNA. Students share their work with capstone at "Capstone Day," which typically occurs at the end of the Spring Semester. This celebration is attended by midshipmen, faculty, staff, families, alumni, and project sponsors. When you attend Capstone Day as a 4/C, 3/C or 2/C, we encourage you to view the work of students across many disciplines and to think about what you would want to be presenting as the culmination of your academic experience when you are a 1/C.

Administration Of Academic Programs

Schedule of Instruction

The calendar year for each Naval Academy class is divided into two semesters and a summer term. The academic year consists of the first and second semester, each semester generally consisting of 15 weeks of instruction and a week of examination. The normal academic routine provides for five days of recitations, lectures, and laboratory periods each week. Academic days are divided into seven periods of 50 minutes, Monday through Friday, while some classes meet Tuesday and Thursday for 75 minute periods. During the seventh period in the fall and spring, the Brigade normally participates in military drill on Monday and a parade on Wednesday. An evening study period is provided every evening except Saturday. Although the seventh period exists, it is seldom used for academic purposes except for three period laboratories, academic advising, and (rarely) tests. To allow for course-wide testing, an extra period, called period X, is inserted into the schedule some days during the semester. The daily schedule is subject to change because of severe weather or to accommodate extraordinary events.

Midshipmen are usually taught in classes of 12-25. These small sections give each midshipman an opportunity to ask questions and to take an active part in classroom discussion. A high ratio of instructors to students also makes it possible to normally assign no more than three or four sections to an instructor. Individual attention is thus characteristic of education at the Naval Academy.

Academic Workload

The normal academic workload for a semester is specified in the matrix of each major program. Midshipmen must take at least 15 credits each semester. One-credit classes not included in a major's matrix cannot be used to reach the 15 credit minimum. A midshipman who is not ahead of the matrix for the major must have the approval of the APAA (Associate Provost for Academic Affairs) or DSAD (Dean of Student Academic Development) to carry fewer courses than constitute a normal academic workload. This authorization is usually granted only in cases where a midshipman has had a severe illness or accident or the midshipman was retained by the Academic Board for a delayed graduation.

Authorization for a reduced program that requires immediate or eventual turn-back to the next lower-class is granted only by the Academic Board. Approval to do so is rare, and is typically related to medical issues. Carrying a reduced academic load incurs a penalty in the computation of the midshipman's rank in class.

To take more courses than specified by the matrix of the major program for any semester, midshipmen must have the approval of their academic advisers. While there is no minimum QPR requirement for upper class midshipmen to carry an overload, the midshipman's academic performance to date should weigh heavily in allowing the midshipman to increase his or her academic burden. Midshipmen may not carry an academic load in excess of 23 semester hours without the consent of the Associate Provost for Academic Affairs.

Midshipmen should also be aware that USNA follows the standard described in the United States Code of Federal Regulations, Title 34 (Education), for a credit hour, which specifies that one credit hour should be equivalent to three hours of student work per week (e.g. one hour of lecture plus two hours of homework) for 15 weeks. Consistency in credit hour determination is important for demonstrating that all courses and programs within USNA are of sufficient academic rigor, content, and depth to meet accreditation requirements and to best serve our students and the USNA mission. It is also important for the transferability of credit between USNA and other institutions of higher education.

The majors at USNA range from 138 to 145 credit hours, with a modal average of 140. Most students average 17-18 credits per semester, which requires 51-54 hours of student work per week to meet the credit hour standard. This requires all scheduled class time (30 hours/week), all of the designated evening study hours, and 6-9 additional hours, which would need to take place on the fringes of the day or on weekends.

Course Selection and the Role of Matrices

Matrices provide a map for what courses to take and when for every major at USNA. The placement of courses in the matrices for the various majors takes into consideration such factors as department teaching loads, course prerequisites, the semester a course is normally offered, and the relationship of professional materials to the summer programs. Rearranging the academic program of a midshipman should not be undertaken without good and sufficient reason. Even then, affected departments should be consulted. Students are expected to adhere to the arrangement of courses depicted in the matrix for their major, except for modifications necessitated by validations, failures, etc. A midshipman normally keeps pace with the matrix of the major or moves ahead of it. The Academic adviser may not allow a midshipman to fall behind in the matrix (even one class) unless specific approval to do so in each case has been obtained from the Associate Provost for Academic Affairs or the Dean of Student Academic Development. It is especially important that midshipmen not fall behind in the sequence of required core technical courses (calculus, physics, naval engineering, electrical engineering, controls engineering) or in the professional courses. In some cases, however, efficient utilization of faculty and optimum assignment of facilities may dictate a change in a particular sequence. The order in which EA/N4XY and EM300 is taught to each major will be determined by constraints that exist within the teaching departments. Although physical education courses are not shown on major matrices, it should be understood that a physical education course is required each semester. All midshipmen complete the same PE courses fourth class through second class years; first class midshipmen chose elective PE courses.

Matrices are approved by the Superintendent's Executive Board. Midshipmen are not permitted to modify matrices. For example, most matrices show a relatively low semester credit load in the second semester of first class year. The purpose is to permit a first-class midshipman the opportunity to overcome an academic deficiency in the final semester before graduation. This should not be regarded as an invitation to move a course to that term from an earlier, more intense term. Midshipmen who are behind in their matrices as a result of failure, light loading, or change of major should make every attempt to correct this deficiency as soon as possible and NOT defer corrective action until the final semesters. This may necessitate a midshipman's attendance at summer school even though the midshipman's QPR may be satisfactory. A higher level course than that called for in a midshipman's matrix may be taken with the permission of the Department Chair or Senior Academic Adviser. For example, EE331 may replace EE301 for non-Engineering majors. Major electives should be courses taught within the major department(s) (plural for interdisciplinary majors). 200-level courses are considered introductory and cannot be used to fulfill major electives. Departmental chairs may review and approve courses outside of the major as a major elective. Some majors at USNA include a "Free Elective." Any course of three or more credit hours at the 200-level or higher may count as a free elective. In addition, SM005 will count as a free elective for individuals who were required to enhance their preparation in mathematics. For STEM majors, FL101 may count as a free elective for language minors (for the following languages only: Arabic, Chinese, Japanese and Russian). No other 100-level courses may count as a free elective. A free elective cannot be a course which fulfills another requirement.

Matrices are divided into three regions: core course requirements, school course requirements, and major course requirements. Core requirements are those that provide the broad background expected of a junior officer and a well-educated citizen. They are essentially common across all majors although there are some accommodations made to differences in majors. School requirements include engineering topics, essential to preparation for naval service, that are integrated among the major courses taken by the ABET majors. For majors in the Schools of Mathematics & Science and the School of Humanities & Social Sciences, EA/N4XY, Principles of Ship Performance, and EM300, Principles of Ship Propulsion, are school requirements. For all non-STEM majors, four semesters of an offered foreign language are required. These courses also constitute a school requirement. The major requirements are those that characterize study in a particular discipline.

Pre-registration and Course Changes

A period of time is set aside in each semester for midshipmen to meet with their advisers and discuss their individual academic programs. Although counseling or advising may take place at any time, this is an important time for midshipmen and their advisers to get together to assess progress and make plans. Care must be taken that all prerequisites will have been met for each course in which a midshipman wishes to preregister. Midshipmen, their advisers, and their instructors should check to be certain that midshipmen are not enrolled in courses for which they do not have the prerequisites. To preregister, midshipmen first see their faculty adviser for academic counseling. Then, using MIDS, they indicate their course preferences for the next semester. Pre-registration is an essential administrative evolution since it provides the information on which departments plan the next semester and allocate their faculty and material resources. To be fair to their classmates, midshipmen should only pre-register for the courses they intend to take, as seats in many courses are limited. Midshipmen who habitually sign up for extra courses and then drop the “extras” at the start of the semester as a method to optimize their personal schedule will lose pre-registration privileges and may face other disciplinary measures.

The registration period which occurs near the end of each semester is the time when midshipmen are assigned schedules. The authority to coordinate among academic departments regarding time and place of recitations and other academic sessions is delegated to the Registrar. The schedule indicates which courses are being offered in the following semester and gives semester hours, prerequisites, and other details. Midshipmen who are involved in certain activities and are designated by the Provost, Commandant, or Director of Athletics may have their schedules arranged to avoid classes during certain periods of the week, using blockers. These blockers cannot be added or removed by Academic Advisers.

It is imperative that the midshipman verifies his/her schedule prior to the start of classes, as schedules are subject to change to accommodate other midshipmen with scheduling needs (students studying here for a semester and/or Academic Board cases). More information on Course Enrollment policies can be found in [PROVOSTINST 1531.59C](#).

There are two critical dates that relate to course changes. The Add Date is marked on the [Academic Calendar](#) and always occurs prior to the 15th calendar day of the semester. A new course can not be added after this date with very rare exceptions (exceptions include changes to the practicum course in the 1/C year due to a changing service assignment, or situations where a student is dropping down a level in a course sequence due to incorrect initial course placement). The Drop Date, also marked on the [Academic Calendar](#), typically occurs at the end of the week in which “12-week” interim grades are posted. A Course Drop is normally not permitted if it will put the mid behind their matrix or below 15 credit hours. The APAA or DSAD may approve course drops due to extenuating circumstances.

Conflicts

Between pre-registration and registration, a midshipman may have a conflict in their schedule. A *hard conflict* exists if two courses occur at the same time. A *soft conflict* exists if the section of the course the midshipman pre-registered for is full. To resolve a conflict, the midshipman must contact their adviser, who will send an electronic MIDRECC via email to the scheduler (at acsched@usna.edu) dropping one of the courses and adding a course that is relevant for the midshipman’s matrix. The Associate Provost for Academic Affairs and the Registrar will publish times and procedures for pre-registration.

Final Examinations and Review Period

Following the last day of classes, one or two days, called the Academic Review and Study, are set-aside with no classes and no examinations. During Academic Review and Study faculty are available to assist their midshipmen in course review. No new material may be covered and no additional course requirements may be imposed on midshipmen. No other activities requiring midshipmen attendance may be scheduled during the Academic Review and

Study Period.

All courses, with a few exceptions granted by the Associate Provost for Academic Affairs prior to the semester, must conduct final examinations during the scheduled exam period. These examinations are usually three hours in length and occur during a six or seven day examination period. Reexamination is not authorized for any course. (See [ACDEANINST 1531.61A](#))

Grades

The letter grade system is used at the Naval Academy wherein individual grades of A, A-, B+, B, B-, C+, C, C-, D+, D and F are assigned numerical Quality Point equivalents (QPE) of 4.0, 3.7, 3.3, 3.0, 2.7, 2.3, 2.0, 1.7, 1.3, 1.0 and 0.0, respectively. A denotes excellence and F denotes failure. More information on the Grading Policy, see [PROVOSTINST 1531.60B](#))

Grades are averaged using a weighted semester hour system called a Quality Point Ratio (QPR). The QPR is computed by multiplying the QPE corresponding to the letter grade received in each course by the semester hours of credit for the course and dividing the sum of these products by the total number of semester hours represented by all of the courses taken. A semester QPR is computed only for courses taken during a given semester. A cumulative QPR is maintained for each midshipman. It includes all academic marks assigned to date. This grading system is the same as that used by most colleges and universities. A cumulative QPR of 2.0 or above is required for graduation and commissioning.

If a midshipman drops a course after the first marking period grade has been submitted, a grade of W withdrawn will be assigned in that course. If a midshipman is separated or resigns prior to final examinations, a grade of W will be assigned in each affected course. To receive credit for a course taken in the semester of separation, a midshipman must complete all requirements in that course, including the final examination.

A grade of Incomplete or I is assigned temporarily, at the end of a semester, in cases where a midshipman is unable to complete the requirements, such as a final examination, for a course due to an emergency or physical disability or illness. A grade of Incomplete is not assigned merely to extend deadlines for work due during the semester. Every effort will be made to accommodate a midshipman in completing a course for which an "I" was assigned. The "I" grade will not be allowed to stand, however, and will not appear on the permanent transcript. A failure to complete all course requirements within a reasonable time after being able to do so, typically within four months, will result in the assignment of a permanent grade of F. Furthermore, a midshipman with an Incomplete in their record (excluding PE courses) at the end of the academic year may have limited summer training and leave opportunities until the Incomplete is resolved.

Interim grades are determined at the end of the sixth and twelfth weeks of instruction. These grades are not part of the midshipman's permanent academic record and are used for information and guidance to the midshipman and the midshipman's advisers. During the sixth and twelfth weeks, many instructors give examinations for the purpose of determining the interim grade. These weeks are called Academic Reserved Periods. In order to accommodate course-wide examinations, a period, called X, may be inserted prior to the first period on certain days.

A student who feels that a grade is unfair, based on demonstrated prejudice or incompetence on the part of a faculty member has the right to grieve their grade. The process for grade grievances is specified in [PROVOSTINST 1531.60B](#).

Order of Merit

A midshipman's rank in class is called the Order of Merit (OOM). The OOM is a principal determinant of a midshipman's service assignment. The OOM has several components: academics, military performance, conduct, physical education, athletics, and professional competence. Grades are assigned in each of these areas and a weighted

sum is used to calculate a total score for each member of the graduating class. The academic component of the OOM counts for roughly 65% of the total score. A midshipman's cumulative QPR (CQPR) and total academic credits comprise the academic component of the OOM. Bonuses are given for semesters with 19 or more credits, Trident projects, enrollment in full-time graduate programs (VGEP), and completion of courses related to the major beyond those required. Semesters with an academic load below 15 credit hours are penalized in the computation. Neither validated courses nor courses taken for a grade in summer school count in the OOM computation. In as much as they allow a midshipman to take courses beyond those required by the major, however, they can play a significant role in enhancing the OOM. More information on the OOM can be found in [USNAINST 1531.51A](#).

Majors Assignment and Changes

The Major Selection and Major Change Request process is described in [PROVOSTINST 1531.59C](#). The major selection process is overseen by the Majors Assignment Review Board (MARB), which consists of the Dean of Student Academic Development (DSAD), the School Senior Academic Advisers, the Registrar, and the Associate Deans of the Schools. During the second semester of 4/C year, the Associate Provost for Academic Affairs (APAA) will open the MIDS major declaration module to allow 4/C midshipmen an opportunity to indicate their academic major preferences. Immediately following the major preferences declaration period, the MARB will convene to review student preferences and to finalize major assignments, considering student preferences, resource limitations, student academic records, and the needs of the Navy. The MARB may reach out to midshipmen for further information should they deem it necessary. If a midshipman wishes to appeal the decision of the MARB they should submit that request to the APAA by the end of the 4/C spring exam period.

To be considered for a change of major, at any time, a midshipman must submit a Major Change Request to the APAA, via their Company Officer, the Senior Academic Adviser (SAA) or Department Chair of the current major, and the SAA or Department Chair of the requested major. The request must be completed in consultation with the midshipmen's academic adviser.

Normally, major change requests are not considered until after the Drop Date of the 3/C Fall. A major change will be considered early only under certain conditions that are described in detail in [PROVOSTINST 1531.59C](#). In some cases a student seeking a major change may need to report to the Advisory Boards which take place concurrently with the Academic Boards in the week before the start of the semester.

Validation

The process by which credit is awarded for previous work equivalent to that covered in courses in the Naval Academy curriculum is known as validation. The Naval Academy's Validation Policy is described on <https://www.usna.edu/Academics/Candidate-Information/Course-Validation-Policy.php>. Many validations occur during fourth class summer. However, validation may take place at any time mutually convenient to the department and the midshipman. Arrangements for validation are to be made by the midshipman with the chair of the department teaching the course.

Validation of a course may be revoked either at the request of the midshipman or the academic department giving the course, if the midshipman's progress in a sequential course indicates the need for reversion to a lower-level course. This action requires approval of the midshipman's academic adviser and the chair of the department concerned. Validation is also removed from the midshipman's record upon enrollment in and completion of the validated course or an equivalent course, as determined by the department involved.

Auditing a course

We do not permit auditing courses. Class visitations are permitted, but normally no more than three visits are allowed.

Summer Academic Program

The Summer School Enrollment Policy can be found in [ACDEANINST 1531.77A](#). Midshipmen attend summer school voluntarily for a variety of reasons. Some wish to move ahead; some seek to improve QPRs by repeating courses in which a D grade was earned; some seek to lighten their academic loads during future fall or spring semesters. Voluntary attendance will occur during a midshipman's leave period. Midshipmen must make all appropriate arrangements to complete scheduled professional training. In this regard, midshipmen and their advisers should note that professional training has higher priority than voluntary summer school attendance.

An adviser may request summer school for a midshipman in *Voluntary with Preference* status if the midshipman is planning to study abroad, attempt a dual major, or for other special opportunities. Note: every attempt will be made to keep the midshipman in that summer course, but it will not replace the Professional Training Event (PTE) required by professional training. The Deputy Director of Academic Advising serves as the point of contact for these issues. If a midshipman plans to study abroad and voluntary summer school is needed, the midshipman should take the course *prior* to traveling abroad as falling behind matrix requirements by two courses results in an Academic Board.

Midshipmen may be directed to attend summer school by the Academic Board or the Academic Advisory Board because of academic deficiencies (often 2 courses behind matrix). A Midshipman who falls behind the major matrix by changing majors must also attend summer school in the summer immediately following the change of major, most likely in voluntary status. A Midshipman who has failed to complete the academic requirements of fourth class year, including those who began mathematics with SM005, must attend summer school before third class year. Summer school attendance that is mandatory may include participation in one or more aspects of the summer professional training program.

Academic probation is not removed by taking summer school. Midshipmen on academic probation entering the summer semester will remain on probation in the fall despite having caught up to their matrix, or raising their QPR during the summer.

No midshipman may take the same course twice during the same summer without the express consent of the Provost. It should also be noted that, while grades in summer school enter into the computation of the CQPR, they do not affect the OOM.

Academic Honors and Opportunities

Honors Lists

Twice annually, lists will be published to recognize midshipmen whose academic performance during the previous semester has been exemplary. These lists are the Superintendent's List, which will recognize outstanding achievement in all graded areas, the Commandant's list, which will recognize outstanding military performance, and the Provost's List, which will recognize outstanding academic achievement. The criteria for each of these lists are provided on <https://www.usna.edu/Academics/MIDN-Resources/Honor-Lists.php>.

Trident Scholar Program

The Trident Scholar Program provides a limited number of exceptionally capable students with an opportunity to engage in independent study and research during their first class year. Under this program, midshipmen standing in the top 10% of their class at the end of the first semester of their second class year are invited to submit proposals for research projects and programs of study.

A Trident Scholar pursues independent research under the guidance of a faculty adviser and carries a reduced number of courses. The research and thesis constitute a major part of the academic program for the year. Trident Scholar courses are numbered XX580 – XX599, where XX is any departmental code. A Trident Scholars Committee, composed of faculty with special interest in scholarship and research, administers the program and recommends the selection of Trident Scholars to the Provost.

Prior to submission of a final written report, each Scholar presents his or her research results to faculty and peers. The accomplishments of the Scholars are celebrated at a formal dinner. The number of scholars in the program in a given year has ranged from 3 to 16. More information on the Trident Scholar Program can be found in [ACDEANINST 1531.68C](#).

Pre-medical/Pre-dental Preparation

The opportunity exists for a very limited number of midshipmen to select Navy Medical or Dental Corps and enter medical or dental school directly upon graduation from USNA. While the Naval Academy does not offer a pre-medical or pre-dental program, midshipmen considering the Medical or Dental Corps will find that a major in chemistry accommodates preparation for medical or dental school most easily. The chemistry and biology classes needed for the Medical or Dental Corps *may* count as free electives (in majors with a free elective) but will *not count* as major electives for majors other than chemistry. Midshipmen are able to select majors other than chemistry and gain entry to the Medical or Dental Corps. The number of graduates permitted to enter the Medical and Dental Corps is limited to 15 per class and standards for acceptance are high (see [USNAINST 1531.47D](#)).

Midshipmen interested in this opportunity should reach out to the Pre-medical/Pre-dental Advising Committee (PPAC) early in their academic program. More information can be found at: <https://www.usna.edu/ChemDept/ChemMajor/med-corps-info.php>.

Graduate Education Opportunities

The Naval Academy offers several graduate education opportunities to qualified midshipmen. These are described in [USNAINST 1520.2AB](#). These include the Officer Scholarship Programs (OSP) (which includes Civilian-Funded Scholarship Programs formerly referred to as the Immediate Graduate Education Program - IGEP), Voluntary Graduate Education Program (VGEP), the Bowman Scholarship Program, the Shoemaker Scholars Program, the Purdue Military Research Initiative (PMRI), and the Accelerated Advanced Education for Navy Aviators. There are also Delayed

Programs, in which the student will start graduate work after some fleet service. Additional information on graduate programs can be found on the Graduate Education website at: <https://www.usna.edu/GraduateEducation/index.php>.

Officer Scholarship Program (OSP)

The number of midshipmen immediately entering OSP scholarships is controlled by the Navy's annual quota (historically 20) and by Headquarters Marine Corps approval of Marine Corps option midshipmen accepting scholarships (~5). Midshipmen may apply for graduate admission and scholarship/fellowship opportunities without permission from the chain of command. However, before accepting a scholarship/fellowship, midshipmen must apply through the Naval Academy's graduate education application process and be placed on a priority-ranked list for filling the Navy and Marine Corps issued quotas, results of which will be published in a USNANOTE 1520. Offers of admission by the various universities may only be conditionally accepted until the USNANOTE 1520 is issued.

The Officer Scholarship Program requires each of its candidates to compete and win some form of civilian-funded scholarship or fellowship that will cover at least 50% of tuition costs. There are a number of scholarships that midshipmen have successfully competed for and won in the past. Information on these scholarships can be found at: https://www.usna.edu/GraduateEducation/Immediate_Programs.php.

Voluntary Graduate Education Program

Midshipmen who have completed course requirements early through any combination of validation and overloading and who have excellent academic records may apply for the Voluntary Graduate Education Program in their Second Class year. If accepted, they can begin work towards a master's degree at nearby civilian universities such as the University of Maryland or Johns Hopkins University. About twenty midshipmen participate annually, starting graduate work during the spring semester first class year and completing their master's degree within seven months of graduation from the Naval Academy. Fields of study are selected from Navy approved graduate education programs leading to Navy subspecialty qualification.

Bowman Scholarship Program

The Admiral Frank Bowman Scholar Program (BSP) began in 2003 to provide enhanced undergraduate academic experiences and some graduate opportunities to a select group of midshipmen who are seeking initial service assignment in the Naval Nuclear Propulsion Program. Each year the BSP will select approximately twenty-five 2/C midshipmen applicants who show significant academic, leadership and research potential in their undergraduate work to date, who are willing to commit to nuclear service, and who subsequently pass a nuclear service entrance interview with the Director of the Naval Nuclear Propulsion Program. In addition to early selection to the nuclear propulsion program, a Bowman Scholar will be afforded the following: USNA-approved internship during 1/C Summer, research project experience, guided by a USNA faculty member of their choice during 1/C year, and an opportunity for immediate graduate education at the Naval Postgraduate School (NPS) after graduation and commissioning for qualified individuals. More information on this program can be found in [ACDEANINST 1531.69](#).

Shoemaker Scholars Program

The Shoemaker Scholar Program allows for Naval Aviation (Navy Pilot and NFO are eligible, USMC aviators are ineligible) selectees (currently 10) to attend an approximately 1-year graduate education program at the Naval Postgraduate School (NPS) in Monterey, California immediately following graduation from USNA. The program is full-time and fully funded. Applicants must be able to matriculate to an NPS Aerospace Engineering curriculum. Selectees will report to NPS at the expiration of their graduation leave, following USNA graduation. Shoemaker Scholars must initiate the application process early in the spring semester of the 1/c year through the Aerospace

Engineering Department. The Shoemaker Scholar Faculty Representative, whose information can be found on the [USNA Graduate Education website](#), will interview all applicants. The Shoemaker Scholar Faculty Representative, in conjunction with the Aerospace Engineering Department Chair, will rank the applicants based upon readiness to matriculate into an appropriate NPS curriculum.

Purdue Military Research Initiative (PMRI)

The Purdue Military Research Initiative (PMRI) has a variable number of annual quotas (-5) to restricted programs at Purdue University. PMRI does not fall under the OSP for quota purposes, but the requirements spelled out for acceptance of scholarships and fellowships to a civilian university remain applicable to PMRI selectees. The choices of programs are specified by Purdue. Midshipmen to be commissioned into the Navy or the Marine Corps may apply.

Navy Burke Program

The Junior Line Officer Advanced Educational Program, known as the Navy Burke Program, was established in 1959 to provide a highly select group of graduates of the U.S. Naval Academy (USNA) and Naval Reserve Officer Training Corps (NROTC) with opportunities for graduate education in science and engineering fields for ultimate assignment to validated subspecialty billets throughout the naval establishment. Selectees are expected to have high career motivation for naval service and have demonstrated outstanding leadership potential as a member of the Brigade of Midshipmen. Following graduation from USNA, all Navy Burke Scholars will report to their warfare communities and complete their initial sea tours, subsequent to which, they may be assigned to NPS to earn a master's degree. The Navy Burke Program described is open to midshipmen oriented toward aviation, submarines, and surface line. The Navy Burke Program is not intended to educate officers in the restricted line or staff corps. Burke Program graduates may request transfer to restricted line or staff corps after at least one warfare development tour following their education tour. Burke Scholars usually attend the Naval Postgraduate School (NPS) in Monterey, California. Officers will not be assigned to curricula at civilian institutions if those curricula are available at NPS. Burke Program officers demonstrating superior academic capability and potential while pursuing a master's degree and continued outstanding professional performance may apply to resume studies for a Ph.D. degree consistent with Navy requirements. Officers participating in graduate education programs on a full-time basis immediately following commissioning are not eligible for the Navy Burke program.

Marine Corps Burke-Equivalent Program

The Marine Corps instituted a program equivalent to the Navy's Burke Program effective with the Class of 1970. Burke-Equivalent Scholars attend graduate school with a choice of technical or non-technical curricula while receiving full pay and allowances. After one tour in the Fleet Marine Force, Marine Corps Burke-Equivalent selectees must apply for the Special Education Program or the Advanced Degree Program. Final acceptance into the Marine Corps Burke-Equivalent Program is contingent upon sustained exemplary performance as a Marine officer. Marine Corps Burke-Equivalent selectees attend NPS or a civilian university, depending on their field of interest and the availability of funds. Assignment normally occurs after the officer's first fleet tour. The same high standards of career motivation and leadership potential are expected of Marine Corps Burke-Equivalent selectees as for the Navy Burke

Community Requested Programs

From time to time, warfare communities may request newly commissioned officers be sent to graduate school. If these programs arise, the Director of Graduate Education Programs (DGEP) will promulgate instructions for applying for and processing applicants to these opportunities. Normally, a notice will be sent to eligible 1/C midshipmen via email. Subcommittees may be designated by the DGEP to select recipients for the requested billets. Examples of these programs include, but are not limited to, the Accelerated Advanced Education for Navy Aviators at NPS.

Research Project Courses

Research courses, numbered XX495 and XX496, are offered in most departments to provide an opportunity for independent scholarship and research under the guidance of a faculty member. Enrollment in these courses is restricted to first and second class midshipmen who have advanced coursework in the area of research and have met other requirements imposed by the departments in which the research is directed. Midshipmen are expected to produce a written proposal and a final written report summarizing their accomplishments and to present their work in a briefing to faculty and peers at the end of the semester. More information on Research Project Courses can be found in [ACDEANINST 1531.79B](#).

Honors Programs

A few departments have offered special and enriched versions of standard courses for midshipmen who show a potential for being able to take advantage of such an educational experience. These programs are governed by [PROVOSTINST 5420.4E](#). Participation is by invitation of the department and enrollment is voluntary on the part of midshipmen. The matrix for an honor major may include a greater number of courses than exist in the corresponding regular major and it may include more rigorous versions of courses in the regular major matrix. Very high standards of academic performance within the major and in other courses are required to achieve the honors designation and a major.

Service Academy Exchange Program (SAEP)

The objective of the Service Academy Exchange Program is to promote a greater understanding among the services. The program is governed by [USNAINST 1531.34C](#). A select number of Midshipmen from each class will have the opportunity to participate in a Midshipmen exchange or immersion program, and an equal number of exchange cadets from these academies visit the Naval Academy at the same time. The Commandant announces the availability of the program early in the spring semester and invites applications from interested third class midshipmen via their chains of command. Selection is based on military and academic standings and the compatibility of the applicant's academic program with the courses available at the Academy to be visited. Midshipmen must work out detailed programs to be taken at their host academies with their major adviser and obtain the permission of cognizant Naval Academy department chairs to obtain credit for the courses they wish to take at their host academies.

Study Abroad

The [International Programs Office](#) offers a number of opportunities for study abroad, including language immersion programs as well as the Semester Study Abroad Program. Interested students should consult [ACDEANINST 5700.1D](#) and [ACDEANINST 5700.2H](#). The Semester Study Abroad Programs are available for all languages taught at USNA - Arabic, Chinese, French, German, Japanese, Russian and Spanish.

It should be noted that a qualified midshipman has to choose between semester study abroad, the service academy exchange program, and the voluntary graduate education program. A student cannot participate in more than one of these programs.

Academic Deficiencies

The policies and procedures that govern Academic Probation and the Academic Board can be found in [USNAINST 5420.24G](#). Note that for the purposes of this policy, an academic term shall mean a fall semester, a spring semester, or summer school. A semester shall mean a fall semester or a spring semester and not summer school.

Academic Probation

A midshipman who meets the criteria below is placed on academic probation

- a. If a midshipman's cumulative quality point ratio (CQPR) is below 2.00 at the completion of a semester, probation for the following semester is automatically imposed. A midshipman is also on automatic academic probation for the semester following two consecutive semesters in which the semester QPR (SQPR) is below 2.00, even though the CQPR remains above 2.00.
- b. If a midshipman is two or more courses behind matrix, the midshipman is on automatic probation for the following semester (not including summer).
- c. A midshipman is automatically on probation for the following semester when retained by the Academic Board after having been subject to possible discharge for deficiency.

Academic Board

The Academic Board consists of the Superintendent, the Commandant of Midshipmen, the Provost, the three School Deans, and two other members appointed by the Superintendent. The Dean of Admissions serves as Secretary to the Board.

Midshipmen found deficient at the end of an academic term (fall, spring, or summer) will be discharged (separated), unless retained by the Academic Board (Title 10, U.S. Code, Section 6963). A deficiency results from one or more of the following:

- a. Failure in two or more of the courses taken to fulfill graduation requirements in a given semester or failure in one or more courses taken to fulfill graduation requirements in summer school.
- b. Failure of an academic course when it increases the total of all academic course failures beyond two.
- c. Failure to remove probation at the end of the semester following that in which it was imposed.
- d. Failure to achieve an SQPR of at least 1.50 for any semester or a QPR of at least 2.00 for a summer school whether attended voluntarily or not
- e. Failure to fulfill any condition as prescribed by the Academic Board as a result of a previous deficiency
- f. Failure to successfully complete all requirements for graduation at the end of the academic term which the midshipman was scheduled to graduate.
- g. Falling two or more semester courses behind the number required by the assigned major program unless this is part of a program for delayed graduation approved by the Academic Board. When the Academic Board (with or without interview) permits a midshipman who is two or more courses behind the matrix to continue, this does not constitute a commitment to turn back. Separation or retention will

be determined according to performance in any subsequent academic term.

- h. Failure to achieve the required standards in prescribed summer training when referred to the Academic Board by the Commandant of Midshipmen.
- i. A deficiency in physical education at the end of an academic term when referred to the Academic Board by the Commandant of Midshipmen.
- j. Failure in a remedial course such as HE101, SM005, or in HE344/HE388 when that course is required because of a writing deficiency.

Single Course Failures

Midshipmen who are not deficient under the categories defined above for the Academic Board, but who fail a single course, are behind their major matrices, and/or have unsatisfactory CQPR's (below a 2.0 for 1/C, 2/C, and 3/C and below a 1.9 for 4/C) may be referred to the Advisory Board. Those referred to the Advisory Board may be directed to complete one of the following actions:

- a. Retain an F.
- b. Repeat a course.
- c. Take an equivalent course in the same discipline to be treated as a repeat course.
- d. Attend summer school.
- e. Alter registration to sequence courses more advantageously.

Repeating Courses

Courses in which a grade lower than a C (i.e. C-, D+, D or F) has been assigned may be repeated for credit with the permission of the APAA or DSAD. The grade achieved upon repeating a course, or completing an equivalent course as determined by the department involved, replaces the original grade for the course in the computation of the Cumulative QPR and the Professional/Military Cumulative QPR. Repeating a course should be done in the immediately following semester, and it is not likely to be approved after the midshipman has successfully completed a follow-on course. Exceptions may be made if the repeated course is in that student's major program of study. A student may not repeat a course to raise a grade of C or better.

Academic Integrity

The Honor Concept

Living honorably is central to the character of a midshipman. The Honor Concept of the Brigade of Midshipmen is the ethical baseline that reaffirms the Brigade's commitment to doing that which is right. The purpose of the Honor Concept is to offer the ethical and moral guidelines for officers in training and promote trust and confidence within the Brigade of Midshipmen.

**Midshipmen are persons of integrity: They stand for that which is right.
They tell the truth and ensure that the truth is known.
They do not lie.**

**They embrace fairness in all actions. They ensure that work submitted as their own is their own, and that assistance received from any source is authorized and properly documented.
They do not cheat.**

**They respect the property of others and ensure that others are able to benefit from the use of their own property.
They do not steal.**

Midshipmen are responsible for enforcing these standards. [USNAINST 1610.3M](#) outlines the mechanism by which the Brigade will enforce USNA's standards of honor. Although this instruction impacts all of USNA, ownership of the Honor Concept remains with the Brigade of Midshipmen.

The Faculty Role with Honor

The faculty role in the Honor Concept is as follows:

- to educate midshipmen on the standards of academic integrity as they apply to individual disciplines
- to communicate clear expectations for the rules regarding collaboration, citation, and the use of resources
- to follow the guidance laid out in [USNAINST 1531.53D](#) for exam administration
- to hold midshipmen accountable when they suspect a violation

Every academic department should have an honor liaison who can help faculty to navigate the honor system as needed.

It is important for all to understand that grading decisions and the honor system are independent from one another. The faculty retain the right to award grades as they see fit, while the Brigade owns the honor system. There are cases where a student will face a grade penalty but yet be found not-in-violation by the honor process and vice versa. However, a student who feels that a grade is unfair based on demonstrated prejudice or incompetence on the part of a faculty member has the right to grieve their grade. The process for grade grievances is specified in [PROVOSTINST 1531.60B](#).

The Honor Pledge

As specified in [USNAINST 1531.53D](#), all quizzes, tests and examinations must include an honor pledge which should be written out by hand and signed or initialed by the midshipman before starting the assessment. The language for this honor pledge was the product of a joint effort between the Brigade Honor Staff and the Faculty Senate, and is as follows:

The Naval Service I am a part of is bound by honor and integrity. I will not compromise our values by giving or receiving unauthorized help on this exam.

Note that it is not sufficient for the instructor to provide these words on the exam and for the student to simply sign or initial, the student is expected to write out or type this pledge on every exam.

Commercial Homework Help Services

The USNA network blocks access to several commercial homework help services. These are for-profit services that have been deemed by the faculty to pose a greater risk to academic integrity than is warranted by their educational benefit. Students are encouraged to consult with their academic advisors and instructors before subscribing to any commercial educational services. Students should also assume that such services are not authorized as resources unless explicitly told otherwise.

Plagiarism

Like all issues related to honor, plagiarism is treated very seriously at the Naval Academy. Committing Plagiarism is an honor offense which could lead to separation. It is important for you to read and understand the following statement, which was developed by the USNA Faculty Senate.

USNA STATEMENT ON ACADEMIC PLAGIARISM

For additional information about plagiarism, see the Nimitz Library's resources on the Ethical Use of Information: <https://libguides.usna.edu/c.php?g=410472&p=2795090> as well as their resources on Avoiding Plagiarism: <https://libguides.usna.edu/c.php?g=410493&p=2795742> and associated libguides.

Majors Programs

This section provides a description and the course plan for each of our major programs. For more information on particular courses and major elective options, please see the course description section.

School of Engineering & Weapons

The School of Engineering & Weapons provides midshipmen an education in fundamental engineering principles that equips them to address the technical needs of the Navy and Marine Corps. The School of Engineering & Weapons at the U.S. Naval Academy is composed of five departments, encompassing nine academic majors.

Midshipmen are immersed in a hands-on, project-based environment geared toward teaching real world engineering problem solving skills by combining practical knowledge and a thorough understanding of mathematical and scientific fundamentals. The complexity of today's Naval weapon and engineering systems mandates a multidisciplinary approach in which revolutionary advancements in applied engineering and technology are brought to the classroom to prepare our graduates for service in the technically advanced Navy and Marine Corps of the 21st Century.

The School of Engineering & Weapons offers the following majors and tracks:

Aerospace Engineering	
Aeronautics	EAS
Astronautics	EASA
Computer Engineering	ECE
Electrical Engineering	EEE
General Engineering	EGE
Mechanical Engineering	EME
Naval Architecture and Marine Engineering	ENM
Naval Architecture and Marine Engineering with Honors	ENMH
Nuclear Engineering	ENR
Ocean Engineering	EOE
Ocean Engineering with Honors	EOEH
Robotics and Control Engineering	ERC
Robotics and Control Engineering with Honors	ERCH

Aerospace Engineering (EAS)

The Discipline and the Major

Aerospace engineering is the design, fabrication, testing, and improving of flight vehicles and systems to solve real-world problems and meet societal needs. Aerospace systems are operated in unforgiving environments that demand rigorous engineering standards and state-of-the-art materials, analysis, and design tools. The major has two tracks: Aeronautics and Astronautics. Aeronautics emphasizes vehicles and systems (manned and unmanned, fixed-wing and rotary-wing) that remain within the atmosphere. Astronautics emphasizes vehicles and systems (manned and unmanned) that operate outside the atmosphere, as well as the launch vehicles that get them into space. Two courses in the 3/C year introduce students to the fundamentals of both tracks. Students then choose one track and take fundamental and specialized courses in topics such as aerodynamics, orbital mechanics, space environment, propulsion, structural design, stability and control, and vehicle design.

Both tracks are supported by modern laboratory facilities. Students conduct experiments in research-quality wind tunnels with air speeds ranging from subsonic to supersonic. A unique rotor lab is used for studying the performance of helicopter rotors and propellers. Propulsion systems are studied by operating reciprocating engines, gas turbines, and rocket motors. Aircraft performance, stability and control principles are taught in the classroom using simulators and are demonstrated in flight with the department's twin-engine aircraft. A satellite ground station allows for monitoring and communicating with the International Space Station and other satellites in orbit. A satellite environmental testing laboratory supports thermal, thermal-vacuum, and vibration tests for student-built small satellites.

In the 1/C year, aerospace engineering students immerse themselves in team-driven capstone projects to design, construct, and operate an aircraft, spacecraft, or similarly interdisciplinary system. Recent aeronautics projects involved remotely-piloted aircraft and rotorcraft designed to carry out a variety of missions. Astronautics projects involved small satellites and payloads launched into Earth orbit to test concepts for future space exploration. These capstone projects often entail collaboration with scientists and engineers at the Naval Research Laboratory, NASA, or other agencies. Capstone teams have also competed and placed well for several years in the NASA Student Launch competition, and provided specialized knowledge and skills on interdisciplinary projects such as the Formula SAE car.

Opportunities

A variety of summer internships with corporations such as Boeing and Lockheed Martin and government agencies such as NASA, SPAWAR, NRO, NRL, and NAVAIR have majors working with engineers and test pilots and personnel on the development and operation of air and space vehicles. Naval Academy aerospace engineering graduates find success in all service assignments. They regularly earn opportunities to enter graduate school, the U.S. Navy Test Pilot School, the Navy Space Cadre, and to fulfill critical roles in program offices improving and testing naval aviation platforms and missiles.

Considerations for those who might be interested in this major

Aerospace students like the combination of big-picture thinking and technical expertise that go into air and space vehicle design. They think critically, communicate clearly, work well in teams, and value a diversity of perspectives. They value how mathematics and computers provide us with a language and a means for formulating and solving real-world problems. They also recognize the value of aerospace engineering knowledge, technologies, and ways of thinking in many other industries such as automotive, wind power, and solar power. Aerospace majors are rewarded with a comprehensive, relevant education that serves them well in the fleet and in future career and education opportunities.

Course Requirements Beyond the Core - Aerospace Engineering (EAS)

EA203 Principles of Aerospace Engineering I (2-2-3)
EA204 Principles of Aerospace Engineering II (2-2-3)
EA208 Engineering Analysis (1-2-2)
EM221 Mechanics for Nuclear Engineering (3-2-4)
EA222 Materials for Aerospace Engineers (3-0-3)
EA232 Dynamics in Aerospace Engineering (3-0-3)
EA301 Aerodynamics I (3-0-3)
EA303 Wind Tunnel Lab (1-2-2)
EA304 Aerodynamics II (3-0-3)
EA305 Fluid and Gas Dynamics (2-2-3)
EM319 Engineering Thermodynamics (3-0-3)
EA322 Structural Mechanics for Aerospace Engineering (3-2-4)
EA401 Performance (3-0-3)
EA413 Stability and Control (3-0-3)
EA429 Aerospace Propulsion - Aero (2-2-3)
EA439 Aerospace System Preliminary Design (1-4-3)
2 Major Electives

Course Matrix - Aerospace Engineering, Aeronautics Track (EAS)

3/C Fall	3/C Spring	2/C Fall	2/C Spring	1/C Fall	1/C Spring
NN220 1-2-2		NS300 1-2-2			NS43X 1-2-2
NE203 3-0-3		NL310 3-0-3			NL400 2-0-2
SP211 3-2-4	SP212 3-2-4		EW300 3-0-3	EW410 3-2-4	
SM221 4-0-4	SM212 4-0-4		EE331 3-2-4		EC310 2-2-3
		HH2XY 3-0-3	HH216 3-0-3	HMSS1 3-0-3	HMSS2 3-0-3
EM221 3-2-4	EA232 3-0-3	EA322 3-2-4			
EA203 2-2-3	EA222 3-0-3	EM319 3-0-3	EA305 2-2-3	EA439 1-4-3	MJ EL1 3-0-3
	EA204 2-2-3	EA301 3-0-3	EA304 3-0-3	EA413 3-0-3	
	EA208 1-2-2	EA303 1-2-2	EA401 3-0-3	EA429 2-2-3	MJ EL2 3-0-3
20	19	20	19	16	16

Total credits: 145

Course Requirements Beyond the Core - Aerospace Engineering, Astronautics Track (EASA)

EA203 Principles of Aerospace Engineering I (2-2-3)
 EA204 Principles of Aerospace Engineering II (2-2-3)
 EA208 Engineering Analysis (1-2-2)
 EM221 Mechanics for Nuclear Engineering (3-2-4)
 EA222 Materials for Aerospace Engineers (3-0-3)
 EA232 Dynamics in Aerospace Engineering (3-0-3)
 EA305 Fluid and Gas Dynamics (2-2-3)
 EM319 Engineering Thermodynamics (3-0-3)
 EA322 Structural Mechanics for Aerospace Engineering (3-2-4)
 EA362 Astrodynamics I (3-0-3)
 EA364 Spacecraft Attitude Dynamics and Control (3-0-3)
 EA367 Spacecraft Communications & Power (3-0-3)
 EA405 Aerospace Propulsion - Astro (2-2-3)
 EA461 Space Environment (3-0-3)
 EA467 Spacecraft System Lab (0-4-2)
 EA469 Space System Design I (1-4-3)
 2 Major Electives

Course Matrix - Aerospace Engineering, Astronautics Track (EASA)

3/C Fall	3/C Spring	2/C Fall	2/C Spring	1/C Fall	1/C Spring
NN220 1-2-2		NL310 3-0-3	NS300 1-2-2		NS43X 1-2-2
NE203 3-0-3					NL400 2-0-2
SP211 3-2-4	SP212 3-2-4		EW410 3-2-4		EW300 3-0-3
SM221 4-0-4	SM212 4-0-4	EE331 3-2-4	EC310 2-2-3	HH216 3-0-3	
		HH2XY 3-0-3		HM SS1 3-0-3	HMSS2 3-0-3
EM221 3-2-4	EA232 3-0-3	EA322 3-2-4	EA305 3-0-3	EA405 2-2-3	MJ EL1 3-0-3
		EM319 3-0-3		EA461 3-0-3	MJ EL2 3-0-3
	EA222 3-0-3		EA367 3-0-3		
EA203 2-2-3	EA204 2-2-3	EA362 3-0-3	EA364 3-0-3	EA467 0-4-2	
	EA208 1-2-2			EA469 1-4-3	
20	19	20	18	17	16

Total credits: 145

Computer Engineering (ECE)

The Discipline and the Major

Computer engineering is a discipline that combines fundamentals from both electrical engineering and computer science. Computer engineers must understand the many different aspects of a computer, ranging from the physics of its low-level components to the computer software that controls its high-level operations.

Computer Engineering majors are required to take courses in computer engineering fundamentals including AC and DC circuit analysis, digital logic systems, electronics and electromechanics, signals and systems, data structures, programming, computer architecture, design of microprocessor-based systems, and computer networking. Computer engineering students will have the opportunity to take electives in embedded systems, computer operating systems, mobile OS development, database systems, microcomputer interfacing, superscalar processor design, VLSI design, advanced computer architecture, computer hardware security, compilers, wireless networks, digital signal processing, computer graphics, biometric signal processing, computer vision, and various machine learning electives.

The capstone senior design laboratory sequence integrates the many skills acquired in preparatory courses so that students can design, implement, test, and demonstrate a significant project. The Hamming Prize for innovative work in computer engineering design is awarded to the best student or team in their capstone course sequence. The Rear Admiral Grace Hopper Award is presented during Commissioning Week to the outstanding graduate in the major.

Opportunities

A number of our students participate in summer internships, have been able to complete language minors, and we work with our majors to facilitate foreign and service academy exchanges. There are many benefits for a computer engineer inside and outside the Navy. The Navy needs officers trained in computer engineering to lead in the development, integration, and security of advanced computer-based systems. This is demonstrated by the recent growth of the Navy IW and Marine Cyber communities. Our computer engineers are uniquely prepared to serve in these roles because they fundamentally learn how to build and secure a computer. Our students' education also prepares them well for any number of technical positions in the civilian world after they leave the Navy. There is currently a shortage of computer engineers in this country and around the world. The major also provides an excellent fundamental background and foundation for continued, more specialized study at the Naval Postgraduate School or any other graduate-level academic institution.

Considerations for those who might be interested in this major

Computer engineering is a good major for someone who enjoys problem solving, who did well with science and math courses in high school, and who is interested in technology. Computer engineering majors apply classroom concepts in the laboratory throughout the program. In fact, the majority of student learning will take place in the laboratory. The department uses a two-pronged strategy to emphasize skills needed by computer engineering majors: (a) individual learning at lab stations to ensure thorough understanding of required skills and (b) team efforts in solving design problems. Labs are regularly updated with leading-edge technology.

Course Requirements Beyond the Core - Computer Engineering (ECE)

EC244 Electronics/Electromechanics (3-2-4)
 EC262 Digital Systems (3-2-4)
 EC356 Computer Networks w/ Security Applications (3-2-4)
 EC361 Microcomputer-Based Design (3-2-4)
 EC362 Computer Architecture (3-2-4)
 EC415 Comp Engr. Design II (2-2-3)
 EE221 Intro to Electrical Engineering (3-2-4)
 EE322 Signals & Systems (3-2-4)
 EE353 Probability, Statistics & Linear Algebra for ECE (3-0-3)
 EE411 Electrical & Computer Engineering Design I (2-2-3)
 EM316 Thermo-Fluid Sci I (3-0-3)
 EM317 Thermo-Fluid Sci II (2-2-3)
 SI204 Intro to Computing (3-2-4)
 SI221 Data Structures (2-2-3)
 SM342 Discrete Structures (3-0-3)
 3 Major Electives

Course Matrix - Computer Engineering (ECE)

3/C Fall	3/C Spring	2/C Fall	2/C Spring	1/C Fall	1/C Spring
NE203 3-0-3	NN220 1-3-2	NS300 1-2-2	NL310 3-0-3	NL400 2-0-2	NS43X 1-2-2
SP211 3-2-4	SP212 3-2-4			EW300 3-0-3	
SM221 4-0-4	SM212 4-0-4	HH2XY 3-0-3		EW370 0-2-1	HH216 3-0-3
				HM SS1 3-0-3	HMSS2 3-0-3
		EE353 3-0-3	SM342 3-0-3	EM316 3-0-3	EM317 2-2-3
EE221 3-2-4	SI204 3-2-4	EE322 3-2-4	EC356 3-2-4	EE411 2-2-3	EC415 2-2-3
EC262 3-2-4	EC244 3-2-4	SI221 2-2-3	MJ EL1 3-0-3	MJ EL2 3-0-3	MJ EL3 3-0-3
		EC361 3-2-4	EC362 3-2-4		
19	18	19	17	18	17

Total credits: 143

Electrical Engineering (EEE)

The Discipline and the Major

Electrical engineering is the discipline of manipulating power and information in the form of electricity. It is a discipline of great breadth that includes topics as diverse as wireless communications, renewable energy, electric transportation systems, instrumentation, signal processing and computational systems (i.e. computers). It provides a thorough technical background that applies to all branches of naval service as well as to civilian life.

Electrical engineering majors are required to take courses in electrical engineering fundamentals including circuit analysis, digital logic systems, semiconductor device electronics, power systems and rotating machinery, communications, electromagnetism, and the design of microprocessor-based systems. Electives are offered in a variety of topics including semiconductor physics, machines and generators, wireless communications, networking, digital signal processing, biometric signal processing, fiber optics, computer architecture, instrumentation, and microcomputer interfacing. Design is emphasized throughout the program.

The capstone senior design laboratory sequence integrates the many skills acquired in preparatory courses so that students can design, implement, test, and demonstrate a significant project. The Steinmetz Prize is awarded each year for innovative work in the electrical engineering design laboratory course sequences. The Captain Boyd R. Alexander Prize in Electrical Engineering is presented during Commissioning Week to the outstanding graduate in the major.

Opportunities

A number of summer internships with organizations such as the National Security Agency and the Naval Research Laboratory provide the opportunity to work with scientists on improving the design, implementation and use of critical defense-related applications. We typically have a number of Trident and Bowman scholars, and many of our graduates go on to graduate study at first tier research institutions. We also have a number of students each year who successfully complete language minors, and we work with our majors to facilitate foreign and service academy exchanges. An electrical engineering degree also opens doors in civilian life. Having this degree is widely regarded as evidence of problem-solving skills and tenacity, and Naval Academy electrical engineering graduates have achieved success in a wide variety of post-service careers including business, law, and consulting.

Considerations for those who might be interested in this major

Electrical engineering is a technically demanding and highly rewarding major. It involves a significant amount of time solving problem sets, doing programming and performing laboratory work. It is a good major for someone who enjoys solving challenging yet important problems, who did well in science and math during the fall semester plebe year, and who is interested in technology. It is a rich, rewarding discipline that opens up a world of opportunity.

Course Requirements Beyond the Core - Electrical Engineering (EEE)

EC262 Digital Systems (3-2-4)
 EC361 Microcomputer-Based Design (3-2-4)
 EE221 Intro to EE I (3-2-4)
 EE241 Electronics (3-2-4)
 EE320 Intro to EE II (2-2-3)
 EE322 Signals & Systems (3-2-4)
 EE353 Prob Stats & Lin Alg ECE (3-0-3)
 EE354 Modern Communication Systems w/Cyber Applications (3-2-4)
 EE372 Engr. Electromagnetics (3-2-4)
 EE411 Electrical & Computer Engineering Design I (2-2-3)
 EE414 Electrical Eng Design II (2-2-3)
 EM316 Thermo-Fluid Sci I (3-0-3)
 EM317 Thermo-Fluid Sci II (2-2-3)
 EW412 Control Eng for Electrical Engineers (3-2-4)
 SI204 Intro to Computing (3-2-4)
 3 Major Electives

Course Matrix - Electrical Engineering (EEE)

3/C Fall	3/C Spring	2/C Fall	2/C Spring	1/C Fall	1/C Spring
NE203 3-0-3	NN220 1-2-2	NS300 1-2-2	NL310 3-0-3	NL400 2-0-2	NS43X 1-2-2
SP211 3-2-4	SP212 3-2-4				
SM221 4-0-4	SM212 4-0-4	HH2XY 3-0-3	HH216 3-0-3		EW300 3-0-3
				HM SS1 3-0-3	HMSS2 3-0-3
		EE353 3-0-3		EM316 3-0-3	EM317 2-2-3
EE221 3-2-4	SI204 3-2-4	EE322 3-2-4	EW412 3-2-4		
EC262 3-2-4	EE241 3-2-4	EC361 3-2-4	EE354 3-2-4	EE411 2-2-3	EE414 2-2-3
		EE320 2-2-3		MJ EL1 3-0-3	
			EE372 3-2-4	MJ EL2 3-0-3	MJ EL3 3-0-3
19	18	19	18	17	17

Total credits: 143

General Engineering (EGE)

The Discipline and the Major

General Engineering is one of the nine engineering majors offered at the Naval Academy. It differs from the other engineering majors in that it is an interdisciplinary, broadly focused major. The initial coursework (e.g. mechanics, materials, fluid dynamics, thermodynamics) for General Engineers is very similar to most of the other engineering majors and you will interact closely in the same courses that other engineers are taking for most of your third- and second-class years. The relatively large number of electives in General Engineering permits a student to seek some depth in one area of interest in engineering. Alternatively, the student may seek exposure to a variety of science and engineering disciplines.

Opportunities

During second-class and first-class year general engineers take several courses principally with other general engineers. In first-class year a general engineering major will take part in an interdisciplinary senior design team either with other general engineers or with other majors from other engineering departments.

Successful general engineers are well equipped to handle the technical aspects of any job in the Navy or Marine Corps. The required courses in the program address all of the engineering topics encountered in the national Fundamental of Engineering Examination. Successful performance in this examination is necessary for becoming a licensed Professional Engineer. A general engineering major from the Naval Academy has the academic background necessary to pursue graduate study in specialized areas of engineering.

Considerations for those who might be interested in this major

Few midshipmen choose general engineering initially. Instead, they transfer into it after finding one of the other engineering majors to be more demanding or more narrowly focused than expected. The major is designed to allow such midshipmen to complete graduation requirements within an accredited engineering program. As described above, the structure of this major is more flexible than any of the other engineering majors. In particular, courses taken previously in another engineering major may count in meeting the requirements of general engineering. This should not be understood to mean that general engineering provides a soft path to graduation; it does not. To achieve success in the general engineering major requires dedication, effort, and fundamental skills in mathematics and science. As a general engineering student progresses through the major, that student will work with his or her adviser to develop a plan that meets both graduation requirements and the student's interests, goals, and abilities.

Course Requirements Beyond the Core - General Engineering (EGE)

EE313 Logic Design & Microprocessors (3-2-4)

EM211 Statics (3-0-3)

EM232 Dynamics (3-0-3)

EM316 Thermo-Fluid Sciences I (3-0-3)

EM317 Thermo-Fluid Sciences II (2-2-3)

EX401 Interdisciplinary Capstone Design I (2-2-3)

EX402 Interdisciplinary Capstone Design II (2-2-3)

SM230 Probability w/ Naval Applications (3-0-3)

EG Introduction Course (1-4-3)

EG Lab Course (2-2-3)

1 Free Elective

2 Math, Science or Engineering Elective

2 Technical Electives

1 Major Elective

Course Matrix - General Engineering (EGE)

3/C Fall	3/C Spring	2/C Fall	2/C Spring	1/C Fall	1/C Spring
NN220 1-2-2	NE203 3-0-3	NS300 1-2-2	NL310 3-0-3	NL400 2-0-2	NS43X 1-2-2
SP211 3-2-4	SP212 3-2-4			EW300 3-0-3	
SM221 4-0-4	SM212 4-0-4	EE331 3-2-4	EC310 2-2-3	EW370 0-2-1	
HH2XY 3-0-3	HH216 3-0-3		HM SS1 3-0-3	HMSS2 3-0-3	
		FR EL 3-0-2			
EG Intro 1-4-2		MSE EL1 3-0-3			MSE EL2 3-0-3
EM211 3-0-3	EM232 3-0-3	SM230 3-0-3	TEC EL1 3-0-3	TEC EL2 3-0-3	EE313 3-2-4
		EG Lab 2-2-3	EM316 3-0-3	EM317 2-2-3	MJ EL1 3-0-3
			MTRL SCI 3-0-3	EX401 2-2-3	EX402 2-2-3
18	17	17	18	18	15

Total credits: 138

Mechanical Engineering (EME)

The Discipline and the Major

Mechanical engineering applies principles of mechanics, the study of heat and energy, an understanding of material behavior, and the application of design principles to create products and systems beneficial to society. The study of mechanical engineering is fundamental to all engineering disciplines. The major is broad-based, encompassing applications in many areas of engineering. After completing the mechanical engineering program at the Naval Academy, one can study the structural mechanics of ships and aircraft, investigate the performance of gas turbine engines, understand the conversion of nuclear energy to power and develop advanced systems such as electromagnetic rail guns and directed energy weapons.

After taking fundamental courses in solid and fluid mechanics, materials, thermodynamics, heat transfer and design, a mechanical engineering major chooses elective courses to concentrate in one of three areas: energy and propulsion, structures and materials or nuclear energy. The major culminates with a capstone design experience in the first class year that provides midshipmen with a relevant, practical opportunity incorporating what they have learned into a single project. The program takes seriously the need to develop graduates who have a sound understanding of the design process and its importance in the success of engineering activities. Each capstone team is expected to design, build and test a mechanical system.

Laboratories and testing facilities dedicated to the mechanical engineering curriculum are numerous and varied. They include a subcritical nuclear reactor and engine testing facilities as well as materials, heat transfer, directed energy and a fluids laboratory. Capstone projects have included building an electromagnetic railgun, formula-style race car, hybrid fuel vehicle, human powered vehicles, interservice competitions focused on developing novel combat equipment and projects that help veterans overcome physical challenges.

Opportunities

The mechanical engineering program prepares its graduates to assume responsibilities in the U.S. Navy and U.S. Marine Corps which involve the operation and maintenance of highly technical systems. With a bachelor's degree in mechanical engineering, a Navy or Marine Corps officer is well prepared for a wide variety of career assignments both ashore and afloat. Operational sea billets in surface ships, submarines, and aircraft squadrons provide a wealth of opportunities for a mechanical engineer to develop practical engineering experience. The knowledge and skills of those with a background in mechanical engineering are in demand in naval service and civilian life.

Considerations for those who might be interested in this major

As a student of mechanical engineering, learning will primarily take place via active problem-solving. Therefore, application and practice of analytical skills will be conducted in the classroom and laboratory. Written and oral communication skills are essential elements of engineering practice and are emphasized throughout the program. Computer programming skills will be employed to analyze and report data. Successful and satisfied mechanical engineering majors are often those that have a desire to understand how things work and how they can make them work better. In addition, a mechanical engineer must understand the mathematical and physical relationships that underlie engineering analysis and design.

Course Requirements Beyond the Core - Mechanical Engineering (EME)

EM211 Statics (3-0-3)
 EM215 Intro to Mech Engineering (1-4-3)
 EM217 Strength of Materials (3-2-4)
 EM232 Dynamics (3-0-3)
 EM313 Material Science (3-2-4)
 EM319 Engineering Thermodynamics (3-0-3)
 EM320 Applied Thermodynamics (2-2-3)
 EM324 Fluid Dynamics (3-2-4)
 EM371 Intro to Design (2-2-3)
 EM375 Mech Engineering Experimentation (2-2-3)
 EM415 Heat Transfer (3-2-4)
 EX401 Interdisciplinary Capstone Design I (2-2-3)
 EX402 Interdisciplinary Capstone Design II (2-2-3)
 3 Major Electives

Course Matrix - Mechanical Engineering (EME)

3/C Fall	3/C Spring	2/C Fall	2/C Spring	1/C Fall	1/C Spring
NN220 1-2-2	NE203 3-0-3	NS300 1-2-2	NL310 3-0-3		NS43X 1-2-2
					NL400 2-0-2
SP211 3-2-4	SP212 3-2-4	EW300 3-0-3	EC310 2-2-3	EW410 3-2-4	
SM221 4-0-4	SM212 4-0-4	EE331 3-2-4		HM SS1 3-0-3	HMSS2 3-0-3
HH2XY 3-0-3	HH216 3-0-3				
EM211 3-0-3	EM232 3-0-3	EM319 3-0-3	EM324 3-2-4	EM415 3-2-4	
EM215 1-4-3	EM217 3-2-4	EM371 2-2-3	EM320 2-2-3	MJ EL1 3-0-3	MJ EL2 3-0-3
		EM313 3-2-4	EM375 2-2-3		MJ EL3 3-0-3
				EX401 2-2-3	EX402 2-2-3
19	21	19	16	17	16

Total credits: 143

Naval Architecture and Marine Engineering (ENM)

The Discipline and the Major

Naval Architecture is about the design of ships, boats and submarines. The design starts with a mission and operating environment, and then the designer works to balance the requirements for interior arrangements, strength, flotation, stability, and even the aesthetic design. Marine Engineering involves the many support systems required to run a floating city, including the selection of engines, propellers, electrical generators, pumps and piping. A successful design requires both Naval Architecture and Marine Engineering, so it is offered as a combined major.

The Naval Architect works with some of the largest and most complex objects produced by humans. A nuclear submarine has 3 million parts. The largest cargo ships are over a quarter-mile long. One electric warship can power the entire city of Annapolis. There are only a few programs nationally that can offer this major because of the specialized nature of the instruction and the large experimental facilities required. We use a towing tank that is longer than a football field to test scale models up to 20-feet long. These facilities allow us to test candidate designs for speed and power, motions in waves, and turning ability.

We typically have 20-30 students per year, allowing us to have hands-on projects and interactive labs. In common with all majors at USNA, naval architects study the fundamental core subjects of calculus, chemistry, physics and the humanities. Along with the other engineering majors, students learn the engineering concepts of mechanics, fluids and materials, and so they will be prepared to enter any number of possible fields later in their careers. Students in the major build and test projects every year, starting with the first courses in 3/C year. Design projects include underwater vessels, workboats, recreational craft, sailboats, unmanned robotic craft, advanced sea skimming vehicles and warships.

Opportunities

Students can participate in study abroad or service academy exchange during the Fall semester of 2/C year. This is open to any school that offers engineering classes. The major includes multiple independent research opportunities in both the 2/c and 1/c year, including an honors research program. During the summers, students have the opportunity to pursue academic internships at design offices, shipyards or research facilities. All 1/C complete both an individual design project for a boat or small ship, as well as a larger group capstone project, giving them the chance to explore topics of their choice in depth. Graduate education programs are available.

This degree program allows for numerous career paths in both the military and civilian sectors. With an identified critical shortage of Naval Architects (both military and civilian) in the coming decades, multiple opportunities exist. Graduates from this major include admirals and astronauts, as well as designers of offshore power and sail boats (including America's Cup), submarines, surface warships, commercial vessels and exotic craft. USNA naval architecture and marine engineering graduates have earned a variety of additional degrees, including the MS, MBA, PhD, JD and even MD degrees. Given their solid backgrounds in design and analysis, our graduates are working as leaders throughout the naval and business worlds and can be found running major government programs, start-up enterprises and Fortune 500 companies.

Considerations for those who might be interested in this major

What does it take to succeed in this major? Most importantly, they should like boats. They should also be able to apply creative and analytical skills to engineering problems. Midshipmen are encouraged to learn more about the major by visiting the Hydro Lab or contacting any of the Naval Architecture and Marine Engineering faculty.

Course Requirements Beyond the Core - Naval Architecture and Marine Engineering (ENM)

EN221 Engr Mech w/ Marine Apps I (3-2-4)
 EN222 Engr Mech w/ Marine Apps II (3-2-4)
 EN247 Princ of Naval Arch & Marine Eng (2-2-3)
 EN330 Probs & Stats w/ Ocean Appl (3-0-3)
 EN342 Ship Hydrostatics & Stability (3-2-4)
 EN350 Marine Engr Systems (2-2-3)
 EN353 Resistance & Prop (3-2-4)
 EN358 Ship Structures (3-2-4)
 EN380 Naval Materials Sci & Engr (3-0-3)
 EN445 Seakeeping & Maneuvering (2-2-3)
 EN471 Ship Design I (2-2-3)
 EN476 Ship Design II (2-2-3)
 EM316 Thermo-Fluid Sciences I (3-0-3)
 EM317 Thermo-Fluid Sciences II (2-2-3)
 1 Math, Science or Engineering Elective
 1 Major Elective

Course Matrix - Naval Architecture and Marine Engineering (ENM)

3/C Fall	3/C Spring	2/C Fall	2/C Spring	1/C Fall	1/C Spring
NN220 1-2-2		NS300 1-2-2	NL310 3-0-3	NL400 2-0-2	NS43X 1-2-2
NE203 3-0-3					
SP211 3-2-4	SP212 3-2-4				EW300 3-0-3
SM221 4-0-4	SM212 4-0-4	EE331 3-2-4	EC310 2-2-3	HH216 3-0-3	EW370 0-2-1
	HH2XY 3-0-3			HM SS1 3-0-3	HMSS2 3-0-3
		EM316 3-0-3	EM317 2-2-3	MSE EL1 3-0-3	
EN221 3-2-4	EN222 3-2-4	EN330 3-0-3	EN353 3-2-4	EN455 2-2-3	
EN247 2-2-3	EN342 3-2-4	EN380 3-0-3	EN358 3-2-4	EN471 2-2-3	EN476 0-6-3
		EN350 2-2-3			MJ EL1 3-0-3
20	19	18	17	17	15

Total credits: 141

This major offers an honors track (ENMH, 144 credit hours)

Nuclear Engineering (ENR)

The Discipline and the Major

Nuclear engineering applies principles of basic sciences, engineering, and radiation physics to the design and development of nuclear power systems and other radiological applications of interest to national security as well as industrial and medical problems. The major is broad-based and covers fundamental engineering subjects such as solid and fluid mechanics, material science, thermodynamics and heat transfer. It also encompasses the study of nuclear physics, nuclear power plants, numerical simulations, health physics, radiation instrumentation and measurement, nuclear proliferation, nondestructive testing using radiological techniques and the use of radiation for medical diagnostics and testing. After completing the nuclear engineering program at the Naval Academy, one will be well prepared to enter a multitude of technical naval and civilian careers.

After taking fundamental engineering courses and introductory courses in nuclear engineering and nuclear physics, one takes courses in reactor physics, reactor design, nuclear energy conversion, and radiation engineering. The major culminates with a capstone design experience in the first class year that provides midshipmen with a relevant, practical opportunity to incorporate what they have learned into a single project. The program takes seriously the need to develop graduates who have a sound understanding of the design process and its importance in the success of engineering activities. Each capstone team is expected to design, build or model some type of nuclear- related system.

Laboratories and testing facilities dedicated to the nuclear engineering curriculum are some of the best in the country for an undergraduate education. They include a subcritical nuclear reactor, two neutron generators, nuclear detection systems, nuclear simulation software and a wide variety of alpha, beta, gamma, and neutron sources. A large range of internships are available at Naval Laboratories, DoD facilities, and National Laboratories during the intersessional period. Internships introduce midshipmen to such topics as advance radiological sensors, nuclear weapon effects, shipboard radiological controls, and nuclear propulsion.

Opportunities

The nuclear engineering program prepares its graduates to assume responsibilities in the U.S. Navy and U.S. Marine Corps which involve the operation and maintenance of highly technical systems. With a bachelor's degree in nuclear engineering, a Navy or Marine Corps officer is well prepared for a wide variety of career assignments both ashore and afloat. Operational sea billets in surface ships, submarines, surface nuclear ships, and aircraft squadrons provide a wealth of opportunities for a nuclear engineer to develop practical engineering experience. The knowledge and skills of those with a background in nuclear engineering are in demand in naval service and civilian life.

Considerations for those who might be interested in this major

As a student of nuclear engineering, learning will primarily take place via active problem-solving. Therefore, application and practice of analytical skills will be conducted in the classroom and laboratory. Written and oral communication skills are essential elements of engineering practice and are emphasized throughout the program. Computer programming and simulation software skills will be employed to analyze and report data. Successful and satisfied engineering majors are often those that have a desire to understand how things work and how they can make them work better. In addition, a successful nuclear engineer must understand the mathematical and physical relationships that underlie engineering analysis and design.

Course Requirements Beyond the Core - Nuclear Engineering (ENR)

EM215 Intro to Mech Engr (1-4-3)
EM221 Mechanics for Nuclear Engr (3-2-4)
EM319 Thermodynamics (3-0-3)
EM324 Fluid Dynamics (3-2-4)
EM415 Heat Transfer (3-2-4)
EM424 Analytical Methods Mechanics (3-0-3)
ER301 Fundamentals of Nuclear Eng (3-0-3)
ER313 Nuclear Material Sci (3-2-4)
ER362 Reactor Physics (2-2-3)
ER371 Nuclear Plant Design (3-0-3)
ER463 Radiation Engr (2-2-3)
ER468 Nuclear Plant Engr (3-0-3)
EX401 Interdisc. Capstone Design I (2-2-3)
EX402 Interdisc. Capstone Design II (1-4-3)
1 Major Elective

Course Matrix - Nuclear Engineering (ENR)

3/C Fall		3/C Spring		2/C Fall		2/C Spring		1/C Fall		1/C Spring	
NN220	1-2-2	NE203	3-0-3	NS300	1-2-2	NL310	3-0-3			NS43X	1-2-2
										NL400	2-0-2
SP211	3-2-4	SP212	3-2-4			EW300	3-0-3	EW410	3-2-4		
SM221	4-0-4	SM212	4-0-4	EE331	3-2-4	EC310	2-2-3				
HH2XY	3-0-3	HH216	3-0-3					HM SS1	3-0-3	HMSS2	3-0-3
EM221	3-2-4	ER301	3-0-3	EM319	3-0-3	EM324	3-2-4	EM415	3-2-4	ER463	2-2-3
EM215	1-4-3			EM424	3-0-3	ER362	2-2-3	EX401	2-2-3	EX402	2-2-3
				ER327	3-0-3	ER371	3-0-3	ER468	3-0-3	MJ EL1	3-0-3
				ER313	3-2-4						
20		17		19		19		17		16	

Total credits: 143

Ocean Engineering (EOE)

The Discipline and the Major

Ocean engineering combines facets of the traditional civil and mechanical engineering disciplines to design systems and structures for operation in the marine environment. The field is diverse, challenging and rewarding. For example, marine systems often have to withstand large forces imparted by pressure, waves, and wind while operating in a very corrosive environment. To prepare the student for this endeavor, the coursework includes fundamental engineering courses including statics, dynamics, strength of materials, fluid mechanics, thermodynamics, and electrical engineering along with marine-specific topics including wave mechanics and materials and corrosion.

The ocean engineering major includes an honors program and features four concentration areas. The concentration areas include civil and coastal engineering, underwater engineering, environmental engineering, and ocean resource management. Each student takes four major electives to gain a depth of knowledge in one or more of these concentration areas. The ocean engineering major is supported by excellent laboratory facilities including the United States Naval Academy Hydromechanics Laboratory. The Hydromechanics Laboratory includes two towing/wave tanks, a coastal laboratory, and two water tunnel facilities along with a host of state-of-the-art measurement systems. The technical nature of the major along with its marine flavor provides a great foundation for the future naval officer in any of the warfare communities.

Opportunities

In the upper class years, students have a range of special opportunities including numerous summer internships and several special projects. Our students have participated in internships at Oceaneering International, Naval Sea Systems Command, Johns Hopkins University Applied Physics Laboratory, Army Corps of Engineers, Aquarius underwater habitat, Woods Hole Oceanographic Institute, and a variety of other civilian and military institutions. Recent special projects have included a human-powered submarine team and a concrete canoe team. These hands-on projects not only allow students to put their engineering skills to work but also allow them to compete against their peers at other universities. The capstone design experience in the first class year allows students the opportunity to work in small groups to design solutions to real-world problems and needs. Graduates select from a variety of warfare specialties in the Navy and Marine Corps. Due to their interest in diving and the underwater engineering track offered within the major, a large percentage of SEAL and EOD candidates major in ocean engineering. Ocean engineers are very marketable and well-compensated in the civilian sector.

Considerations for those who might be interested in this major

The major strikes a balance of theory, laboratory/experimental work, and practical application. Students who excel in the major are typically strong in mathematics and science. The ocean engineering major does require hard work and study but it can also be very gratifying, particularly for students who gravitate towards hands-on activities and love the ocean.

Course Requirements Beyond the Core - Ocean Engineering (EOE)

EM211 Statics (3-0-3)
 EM217 Strength of Material (3-2-4)
 EM232 Dynamics(3-0-3)
 EM317 Thermo-Fluids Science II (2-2-3)
 EM324 Fluid Dynamics (3-2-4)
 EN245 Principles of Ocean Sys Engr (2-2-3)
 EN275 Ocean Measurement & Analysis (3-0-3)
 EN330 Probs & Stats w/Ocean Apps (3-0-3)
 EN380 Naval Material Science & Engr (3-0-3)
 EN441 Ocean Engr Struct I (3-2-4)
 EN461 Ocean Sys Engr Design I (2-2-3)
 EN462 Ocean Sys Engr Design II (2-2-3)
 EN475 Ocean Engr Mechanics (3-2-4)
 4 Major Electives

Course Matrix - Ocean Engineering (EOE)

3/C Fall	3/C Spring	2/C Fall	2/C Spring	1/C Fall	1/C Spring
	NE203 3-0-3	NS300 1-2-2	NL310 3-0-3	EW370 0-2-1	NS43X 1-2-2
	NN220 1-2-2			EW300 3-0-3	NL400 2-0-2
SP211 3-2-4	SP212 3-2-4				
SM221 4-0-4	SM212 4-0-4	EE331 3-2-4	EC310 2-2-3	HM SS1 3-0-3	HMSS2 3-0-3
HH2XY 3-0-3		HH216 3-0-3			
EM211 3-0-3	EM232 3-0-3	EM324 3-2-4	EM317 2-2-3		
		EM217 3-2-4	EN330 3-0-3	MJ EL1 3-0-3	MJ EL3 3-0-3
			EN441 3-0-3	MJ EL2 3-0-3	MJ EL4 3-0-3
EN245 2-2-3	EN275 3-0-3	EN380 3-0-3	EN475 3-2-4	EN461 2-2-3	EN462 2-2-3
17	19	20	19	16	16

Total credits: 142

This major offers an honors track (EOEH, 145 credit hours)

Robotics and Control Engineering (ERC)

The Discipline and the Major

Robotics and Control engineering is a study in automation, the design and construction of systems or devices that work by themselves with little or no direct human control. We prepare midshipmen for the challenges and opportunities of a Fleet that embraces the new paradigm of autonomy. Many of the subjects we teach and research are traditionally included within the mechanical or electrical engineering departments elsewhere. At the Naval Academy a major such as ours, dedicated to control of engineering systems, aligns nicely with the department's weaponry lineage.

The fundamental aspects of the discipline include sensors, actuators, feedback loops, computing, and computer programming which are taught in the youngster and junior years. In the first class year, a Robotics and Control major will concentrate in two application areas chosen from among the following five: estimation (getting quantitative information from raw data) and control, robotics (both large and small, in any domain: sea, land, air, space), embedded computing (programming portable devices), signal processing (including images), and engineering management. An honors version of the major exists for exceptional students. Most of the laboratories and projects involve design, analysis, and experimentation with devices in the aforementioned fields and, therefore, the department is equipped with a variety of sensing and actuation technology as well as a robust technical support staff.

Opportunities

In the first class year, Robotics and Control majors have the opportunity to apply their knowledge of the discipline and learn about the engineering design process as part of their capstone project, which is the highlight of their studies. Upon graduation our majors join their selected communities with great confidence as their studies have prepared them for a technology-rich workplace. Those who do not pursue a naval career will find ample opportunity in the defense sector, automotive, robotic, and biomedical industries to mention a few. Additionally, many graduates also go back to school for graduate studies in control, mechanical, electrical, biomedical, and chemical engineering.

Considerations for those who might be interested in this major

The "lifestyle" of the Robotics and Control major is similar to that of other engineering majors. The year includes course-related special events, internships, and nationwide competitions. Weekly life includes homework assignments and work in the lab. Computers are necessary tools for design and analysis as well as integral components of the systems under investigation. The math skills acquired in calculus and differential equations, and complemented by an engineering math course, are essential for in-depth understanding of systems. The technical abilities necessary to implement and integrate autonomous system are taught in youngster year. Our facilities support a curriculum that integrates land, sea, and air robotics capabilities. Our faculty are also experts in diverse control applications like the Internet of Things (IoT), cyber physical systems, human-machine interfaces, exoskeletons, soft robotics, and microrobots. The major is one that interests the curious and creative mind; one discovers the latest technology and also learns to use it in new ways.

Course Requirements Beyond the Core - Robotics and Control Engineering (ERC)

EM211 Statics (3-0-3)
 EM232 Dynamics (3-0-3)
 EM316 Thermo-Fluid Sci I (3-0-3)
 EM317 Thermo-Fluid Sci II (2-2-3)
 EW200 Intro to Programming & Design (3-2-4)
 EW202 Principles of Mechatronics (2-2-3)
 EW301 System Modeling & Simulation (2-2-3)
 EW305 Linear Control Engr (3-2-4)
 EW306 Adv Control Engr (2-2-3)
 EW309 Guided Design Exp (0-4-2)
 EW401 Engr Design Methods (2-2-3)
 EW404 Robotics & Control Eng Design (1-4-3)
 SM316 Engr Math w/ Prob & Stats (3-0-3)
 5 Major Electives

Course Matrix - Robotics and Control Engineering (ERC)

3/C Fall	3/C Spring	2/C Fall	2/C Spring	1/C Fall	1/C Spring
NN220 1-2-2	NE203 3-0-3	NS300 1-2-2	NL310 3-0-3		NS43X 1-2-2
					NL400 2-0-2
SP211 3-2-4	SP212 3-2-4			HH216 3-0-3	EW300 3-0-3
SM221 4-0-4	SM212 4-0-4	EE331 3-2-4	EC312 2-2-3	HM SS1 3-0-3	HMSS2 3-0-3
	HH2XY 3-0-3				
EM211 3-0-3	EM232 3-0-3	SM316 3-0-3	EM317 2-2-3	EW401 2-2-3	EW404 1-4-3
		EM316 3-0-3	EW309 0-4-2	MJ EL2 3-0-3	MJ EL5 3-0-3
EW200 3-2-4	EW200 2-2-3	EW301 2-2-3	EW306 2-2-3	MJ EL3 3-0-3	
		EW305 3-2-4	MJ EL1 3-0-3	MJ EL4 3-0-3	
17	20	19	17	18	16

Total credits: 142

This major offers an honors track (145 credit hours)

School of Humanities and Social Sciences

The School of Humanities and Social Sciences develops future naval officers to communicate clearly and understand the context and lessons of history. Our faculty introduce midshipmen to the realm and influence of politics, government, and the role of economics in national security strategy while expanding their understanding of the human experience, foreign cultures, and languages. Our faculty are outstanding teachers to Midshipmen, recognized scholars in their fields, and leaders at the Naval Academy.

The unique strength of the Humanities and Social Sciences at the Naval Academy is laying the foundation for strategic thinking. Our ability to inculcate abstract and inductive critical thinking to complement the Academy's core technical curricula with the cognitive, creative, and social aspects of a traditional liberal arts education results in Navy and Marine officers who are prepared to be, in the words of the Education for Seapower Study, "steeped not only in the art of war, the profession of arms, and the history and traditions of the Naval service, but also in a broader understanding of the technical and strategic complexities of the Cognitive Age."

The School of Humanities and Social Sciences offers the following majors and tracks:

Arabic	FLA
Chinese	FLC
Foreign Area Studies	FAS
Foreign Area Studies - Asia	FASA
Foreign Area Studies - Middle East	FASM
English	HEG
English with Honors	HEGH
History	HHS
History with Honors	HHSH
Political Science	FPS
Political Science with Honors	FPSH
Quantitative Economics	FQE
Quantitative Economics with Honors	FQEH

Arabic (FLA)

The Discipline and the Major

Arabic has been deemed a priority strategic language under the National Strategic Language Initiative. The US Armed Forces and the US Government seek to increase competencies in strategic languages to foster both diplomatic and military uses of these languages in the world today. Studying Arabic as a major entails taking a total of 42 credit hours: ten courses in the Arabic language and four collateral major electives, taught in English, covering topics related to the Arab World and the Arabo-Islamic culture. There are six courses of the ten language courses which majors are required to take (or, more rarely, validate). The remaining four language courses are selected from a set of 300- and 400-level classes which are offered in a rotating fashion. There are research opportunities, especially for the most advanced students, and/or those who study abroad. The collateral major electives taught in English include courses in Middle Eastern politics, Middle Eastern history, economics, Arabic literature, anthropology, linguistics and Islam. We urge every Arabic major to benefit greatly from a period of time in an Arabic speaking country on one of the study abroad programs listed below.

Opportunities

Studying Arabic opens doors to some very exciting opportunities while here at the Academy. These include Language Study Abroad Programs (LSAP), for which midshipmen become eligible to apply in their second year of studying the language. Similarly, midshipmen may apply for Semester Abroad programs in the Arab World, managed by the International Programs Office (IPO) here on the Yard. Midshipmen have studied for a semester in Egypt, Qatar, Jordan, Oman, Morocco and Israel. Students have also successfully applied to programs outside the Academy for study abroad. A growing number of midshipmen studying Arabic have been awarded Critical Language Scholarships (by the Department of State) in several places in the Arab World including Jordan, Tunisia, Oman, and Morocco. The IPO also manages Language, Regional Expertise and Culture (LREC) trips to numerous places in the world.

Some students studying Arabic have sought to earn a second major in political science, economics, or history. Using the collateral major electives, students have also created subfields of interest in political science, history, literature, or linguistics. After graduation, Arabic majors may work in intelligence, be given additional training at Defense Language Institute, seek funding for an Olmsted scholarship, work toward becoming a Foreign Area Officer, and so forth. The uses of Arabic in civilian life are plentiful in government service, business, non-governmental organizations, and additional scholarship.

Considerations for those who might be interested in this major

The study of Arabic is very demanding. It requires a minimum of two hours of preparation between classes or 6 hours of work per week outside of each class in the first two years of study. Students should be good language learners, and have had previous experience successfully learning a language.. Knowing how to commit things to memory is a significant advantage for the language learner. Success in the study of Arabic requires a willingness to work hard but, as with other worthwhile achievements, the rewards are great.

Course Requirements Beyond the Core - Arabic (FLA)

FA121 Intensive 100-Level Arabic I (3-0-3)

FA123 Intensive 100-Level Arabic II (3-0-3)

FA220 Intensive 200-Level Arabic I (3-0-3)

FA222 Intensive 200-Level Arabic II (3-0-3)

FA321 300-Level Arabic I (3-0-3)

FA322 300-Level Arabic II (3-0-3)

FA3XX Arabic Language Elective - Fall (3-0-3)

FA3XY Arabic Language Elective - Spring (3-0-3)

The courses available to fulfill these language electives include

FA325 Media Arabic, FA315 Arabic Conversation and Composition (usually offered in the fall) and

FA342X Dialect Arabic (with the X being replaced by a letter which indicates the specific dialect variety being offered), and FA334 Topics in 300-level Arabic, usually offered in the spring.

FA4XX 400-level Arabic - fall (3-0-3)

FA4XY 400-level Arabic - Spring (3-0-3)

Similarly, FA4XX is for 400-level course is offered in the Fall, and FA4XY is for whatever 400-level class is offered in the spring. Current offerings are FA425 Advanced Arabic Discourse, FA426 Modern Arabic Literature, and FA485 Topics in Advanced Arabic (including research/ capstone-like courses)

4 Major Electives

The four FLA major electives are fulfilled by courses taught in English offered by History, PoliSci, and Languages and Cultures which deal with aspects of the Arab World, Arabic Culture, Middle Eastern History, Middle Eastern Politics, the economy of the Middle East, Islam and the Middle East and North Africa. At least two of these Major Electives must be from outside FA offerings. The two FA major electives offered regularly are FA350E Window on Arabic Culture and FA378E Topics in Arabic Literature in Translation.

Course Matrix - Arabic (FLA)

3/C Fall		3/C Spring		2/C Fall		2/C Spring		1/C Fall	1/C Spring
NN220	1-2-2	NE203	3-0-3	NL310	3-0-3	NS300	1-2-2		NS43X 1-2-2
				EC310	2-2-3				NL400 2-0-2
SP211	3-2-4	SP212	3-2-4	EM300	3-2-4	SM2XY	3-0-3	EA/N4XY 3-2-4	EW300 3-0-3
SM223	4-0-4					EE301	3-2-4		EW370 0-2-1
HH216	3-0-3	HH215M	3-0-3	HM SS1	3-0-3	HMSS2	3-0-3	FR EL 3-0-3	
FA121	3-0-3	FA220	3-0-3	FA321	3-0-3	FA322	3-0-3	FA4XX 3-0-3	FA4XY 3-0-3
FA123	3-0-3	FA222	3-0-3					FA3XX 3-0-3	FA3XY 3-0-3
		MJ EL1	3-0-3			MJ EL2	3-0-3	MJ EL3 3-0-3	MJ EL4 3-0-3
19		19		16		18		16	17

Total credits: 140

Chinese (FLC)

The Discipline and the Major

As one of the only two foreign language majors in the Languages and Cultures Department, the Chinese major allows midshipmen to develop proficiency in spoken and written Chinese (Mandarin) and in Chinese culture, past and present. The major entails 10 mandatory language courses (30 credit hours), and 4 collateral courses (12 credit hours) selected from a series of electives on Chinese history, politics, society and culture. Midshipmen majoring in Chinese learn how to communicate and interact in culturally appropriate ways with Chinese native speakers. Midshipmen graduating with a Chinese major usually reach a near-intermediate level of language proficiency in the three modalities: speaking, listening, and reading. Midshipmen develop the ability to understand short adapted speeches and conversations on familiar topics and to express ideas with limited vocabulary and acceptable fluency and accuracy. Proficiency in Chinese language and culture serves as a solid foundation for continued language training and development.

Opportunities

The Chinese major opens doors to some very exciting opportunities while here at the Academy. These include the Language Study Abroad Programs (LSAP), for which midshipmen become eligible to apply in their second year of studying the language. Upon entering the Naval Academy, a midshipman with prior background in the language may validate a maximum of 4 language courses and be placed in a higher level language course. Such a high-beginning midshipman is usually advised to fulfill the major requirements by taking more than just another 6 language courses, in order to reach a higher level of language proficiency than the true beginners. During the 8-semester study of Chinese language and culture, a midshipman may apply for a short overseas language and culture immersion program and/or a one-semester language abroad program, subsidized by the International Programs Office (IPO). These enrichment programs greatly improve the participants' language levels and their cultural understanding and awareness, leading to high-placement in language courses and validation of certain required courses for the major (from the semester). Both programs are selective and competitive. They provide equal opportunities to Chinese majors and other majors taking Chinese courses.

Considerations for those who might be interested in this major

An analytical mind plus an initiative to practice is essential, since adult foreign language learning in the classroom is both a science and an art. Midshipmen learn the language system through its grammar structures, and they make the language their own through acting out excerpts of communication in the form of a performing art. Continued motivation, hard work and time commitment are crucial for the study of Chinese. Mastery of oral and written forms through imitation, repetition and memory must be a part of the student's daily experience. Practice makes perfect. The faculty looks forward to developing more Chinese majors to meet the needs of the Navy and the nation in their interactions with China and its people.

Course Requirements Beyond the Core - Chinese (FLC)

FC121 Intensive 100-Level Chinese I (3-0-3)
 FC123 Intensive 100-Level Chinese II (3-0-3)
 FC220 Intensive 200-Level Chinese I (3-0-3)
 FC222 Intensive 200-Level Chinese II (3-0-3)
 FC301 3rd Yr Chinese I (3-0-3)
 FC302 3rd Yr Chinese II (3-0-3)
 FC4XX Chinese Language & Culture I (3-0-3)
 FC4XY Chinese Language & Culture II (3-0-3)
 FC4XZ Styles of Discourse in Chinese (3-0-3)
 FC4X- Chinese in Media (3-0-3)
 1 Free Elective
 4 Major Electives

Course Matrix - Chinese (FLC)

3/C Fall	3/C Spring	2/C Fall	2/C Spring	1/C Fall	1/C Spring
NN220 1-2-2	NE203 3-0-3	NL310 3-0-3	NS300 1-2-2		NS43X 1-2-2
					NL400 2-0-2
SP211 3-2-4	SP212 3-2-4	EM300 3-2-4	SM2XY 3-0-3	EA/N4XY 3-2-4	EW300 3-0-3
SM223 4-0-4		EC310 2-2-3	EE301 3-2-4		EW370 0-2-1
HH2XY 3-0-3	HH216 3-0-3	HM SS1 3-0-3	HMSS2 3-0-3	FR EL 3-0-3	
FC121 3-0-3	FC220 3-0-3	FC301 3-0-3	FC302 3-0-3	FC4XX 3-0-3	FC4XY 3-0-3
FC123 3-0-3	FC222 3-0-3			FC4XZ 3-0-3	FC4X- 3-0-3
	MJ EL1 3-0-3		MJ EL2 3-0-3	MJ EL3 3-0-3	MJ EL4 3-0-3
19	19	16	18	16	17

Total credits: 140

English (HEG)

The Discipline and the Major

Read closely. Think critically. Write clearly. The English major fosters these skills through the study of literature from the past and the present across the globe. Class sessions in the English major unfold primarily as directed discussions that build connections between the texts that midshipmen study in the classroom and the world outside. The major consists of ten required courses, including a 200-level introduction to literary theories and methods; two courses centered on different literary periods; a diverse literature elective; and a culminating capstone seminar on one of a variety of topics ranging from a literary problem or period to an author or genre. Through their choice of courses and the opportunity for independent study projects, English majors can tailor their course of study to concentrate on literary periods, genres, or creative and professional writing. Students who excel in the major may pursue an honors degree. In this case, the capstone seminar is replaced with two focused seminars in advanced topics, one involving an interdisciplinary approach to a topic in literature and the arts (for example, “Satire from *A Modest Proposal* to *The Daily Show*”) and the second offering specialized study of a particular literary figure, period, or problem (for example, “Tex-Mex Literature”).

Opportunities

English majors have the chance to hone communication skills that prove invaluable to Navy and Marine Corps officers. Leaders need to think critically and communicate effectively, and much of that communication is done in writing. English majors enjoy unique opportunities and experiences in the classroom and beyond. Students often call on the expertise of faculty members to direct them in independent studies focused on an area of special interest. They are also involved in essay, poetry, and playwriting competitions, as well as writing for, editing, and publishing the *Labyrinth*, the USNA literary magazine. Those who enjoy acting and other aspects of theater can take advantage of the *Masqueraders*, the oldest ECA on the Yard and a highly regarded drama group that offers a major production each year. Many English majors volunteer to serve as peer tutors in the Writing Center. English majors participate in study abroad programs and summer internships, and they are successful in earning scholarships for graduate education in various disciplines. Upon commissioning, English majors join all service communities. They become Medical Corps officers, pilots, SEALs, submariners, surface warfare officers, and Marines. Their training in the English major enables them to succeed in a variety of situations, whether advising leaders on matters of public affairs or educating an entire elite squadron on the intricacies of helicopter systems. In civilian life, English majors can be found working in business, government, law, education, journalism, publishing, the defense industry, and non-profit organizations.

Considerations for those who might be interested in this major

All types of students succeed in the English major. However, those who like to read actively and write persuasively and are fascinated by the dynamics of human behavior end up getting the most out of the major and performing well in it. English majors become experts in communication in the broadest sense. They read literary works in a variety of styles and forms and from a variety of historical periods and places around the world. They think critically about culture, identity, and representation. They write about complex ideas with precision and clarity.

Course Requirements Beyond the Core - English (HEG)

HE242 Methods of Literary Analysis (3-0-3)

HE333 Shakespeare (3-0-3)

Pre-1800 Literature Elective (3-0-3)

Pre-1900 Literature Elective (3-0-3)

HE37X Diverse Literature Elective (3-0-3)

Capstone (3-0-3)

4 Major Electives

4 Language Courses

1 Free Elective

Course Matrix - English (HEG)

3/C Fall		3/C Spring		2/C Fall		2/C Spring		1/C Fall		1/C Spring	
NN220	1-2-2	NE203	3-0-3	NL310	3-0-3	NS300	1-2-2	NL400	2-0-2	NS43X	1-2-2
SP211	3-2-4	SP212	3-2-4								
SM223	4-0-4	SM2XY	3-0-3	EC310	2-2-3	EE301	3-2-4			EW300	3-0-3
HH2XY	3-0-3	HH216	3-0-3	HM SS1	3-0-3	HMSS2	3-0-3	EA/N4XY	3-2-4	EW370	0-2-1
								EM300	3-2-4		
FL101	3-0-3	FL102	3-0-3	FL201	3-0-3	FL202	3-0-3			FR EL	3-0-3
HE242	3-0-3	HE333	3-0-3	PRE1800	3-0-3	PRE1900	3-0-3	HE37X	3-0-3	MJ EL4	3-0-3
				MJ EL1	3-0-3	MJ EL2	3-0-3	MJ EL3	3-0-3	CAPSTONE, 3	
19		19		18		18		16		15	

Total credits: 140

This major has an honors track (HEGH, 145 credits).

Foreign Area Studies (FAS)

The Discipline and the Major

The Foreign Area Studies major is designed to give insight into the study of global society while focusing on selected regions. Special emphasis is placed on the study of particular areas, enriched through social scientific research (including theories and methods surrounding cultural studies) and the investigation of humanistic endeavors, i.e., how the knowledge of a given culture, with its particular language, economy, literature, art, political structure and history, constitutes the basis for a better understanding of the societies of the world, including one's own. The goal is to go beyond American and Eurocentric points of view in order to understand the world from a more native perspective, to uncover the internal logic that is reflected in various expressions of deep-rooted cultural values. The assumptions, meanings, social structures and dynamics of another society and culture are thus made more comprehensible, creating opportunities for self-reflection that may expand and even challenge assumptions about one's own society and culture.

Opportunities

Majoring in FAS opens doors to USNA-sponsored Language Summer Study Abroad Programs (LSAP) as well as semester abroad programs (SSA) throughout the world. Long term, this major could lead to a career that includes service as a Foreign Area Officer (FAO). With the FAS major under their belts, midshipmen will be able to analyze, understand and interpret other cultures through a multi-disciplinary lens, one that is essential to a well-rounded understanding of a region.

Considerations for those who might be interested in this major

While the FAS major is by definition interdisciplinary, midshipmen should select a track within one of the following academic specialties: Cultural Studies, History or Political Science. Midshipmen should also focus on one or more of the following regions and languages.

Note: for the classes of '24, '25, and '26, only the first two areas listed below are to be offered. The other regions will be offered in future years as the program develops.

- East Asia/Eurasia: Chinese, Japanese and Russian
- Middle East/North Africa: Arabic and French
- Africa: Arabic, French and Portuguese
- Europe: French, German, Portuguese, Russian and Spanish
- Latin America: Spanish and Portuguese

Course Requirements Beyond the Core - Foreign Area Studies (FAS)

FL210 Foundations in Area Studies (3-0-3)

FE210 Introductory Economics (3-0-3)

FE314 International Trade and Policy (3-0-3)

FP2XY Intro to International Relations or Intro to Comparative Politics (3-0-3)

6 Language Courses

4 Major Electives

Capstone

Course Matrix - Foreign Area Studies (FAS)

3/C Fall	3/C Spring	2/C Fall	2/C Spring	1/C Fall	1/C Spring
NE203 3-0-3		NS300 1-2-2	NL310 3-0-3	NL400 2-0-2	NS43X 1-2-2
NN220 1-2-2					
SP211 3-2-4	SP212 3-2-4	EM300 3-2-4	EE301 3-2-4	EW300 3-0-3	EA/N4XY 3-2-4
SM223 4-0-4	SM208 3-0-3	EC310 2-2-3		EW370 0-2-1	
	HH2XY 3-0-3	HH216 3-0-3	HM SS1 3-0-3		HM SS2 3-0-3
LANG1 3-0-3	LANG2 3-0-3	LANG3 3-0-3	LANG4 3-0-3	LANG5 3-0-3	LANG6 3-0-3
FL210 3-0-3	FE210 3-0-3	FE314 3-0-3	MJ EL1, 3	MJ EL3, 3	
	FP2XY, 3		MJ EL2, 3	MJ EL4, 3	CAPSTONE, 3
19	19	18	19	15	15

Total credits: 140

History (HHS)

The Discipline and the Major

The mission of the History Department is to produce graduates who possess a fundamental understanding of and proficiency in the academic discipline of history. The major provides an opportunity to examine the evolution of past civilizations and to learn about their achievements, institutions, and cultural values. History majors learn to study ideas critically, to sift through a variety of historical evidence, and to draw conclusions about different societies and events in a clear and concise way. By understanding the complexity of historical events, students become more aware of the contemporary political, social, cultural and military issues that are important to our own society.

The goals of the major include proficiency in historical methods, writing and analysis; awareness of historical context, causation and culture; understanding of the trends, forces, and individuals that shaped the past as well as the historical roots of contemporary affairs; appreciation of the diversity of the human experience across time and place; and understanding of the importance of history to the profession of arms. The major consists of ten courses beyond the three history courses in the core. These include three seminars: an introductory seminar, a methods seminar, and a first-class capstone, which may either be a research paper seminar or a historiography seminar. Majors select upper-division courses from the following distribution areas:

- American history
- European history
- Regional history
- Naval and military history
- Thematic history

In order to complete the distribution requirement for graduation, students must select seven courses in four of the five fields. In addition, all history majors are required to complete four semesters of a foreign language and two humanities electives in fields other than history.

The honors program in history offers high-performing students the opportunity to pursue a more challenging curriculum and earn a designated honors degree. Students who meet the CQPR requirement for entry are invited to apply for admission to the program at the end of the fall semester of the 2/C year. Those who are accepted into the program follow the normal history matrix except that they will take one honors seminar and one honors colloquium in lieu of two upper-level electives during the spring semester 2/C year. They will also choose a faculty member to be an adviser for their honors thesis: a 40-page research paper. All successful theses are bound and placed in Nimitz Library.

Opportunities

The history major at the United States Naval Academy prepares midshipmen to serve in all Navy warfare communities and the Marine Corps. The major prepares midshipmen to enter a wide variety of graduate programs. The combination of analytical skills and writing ability along with the required technical core courses makes USNA History majors both desirable and successful in graduate programs of all kinds. Graduate work in history is an obvious possibility, but USNA history majors have been successful in law school, M.B.A. programs, and in other graduate programs, such as public policy, public administration, and national security.

Summer internship opportunities are available to History majors. Qualified majors are eligible for the Voluntary Graduate Education Program while they are still at the Naval Academy.

Considerations for those who might be interested in this major

The history major requires a significant amount of reading, writing, and library research. Computer literacy is also important, as the computer has become a major tool for historical research. To succeed in the major, a student must be willing to develop to the fullest his or her analytical reading and writing skills, and to master historical research methods.

Course Requirements Beyond the Core - History (HHS)

HH200 The Historian's Craft (3-0-3)

HH300 Research in History (3-0-3)

HH400X Capstone (3-0-3)

At least one elective course in four of the five following distribution groups:

1 American History Elective (3-0-3)

1 European History Elective (3-0-3)

1 Regional History Elective (3-0-3)

1 Thematic History Elective (3-0-3)

1 Military History Elective (3-0-3)

3 Additional Major Electives

2 Hum/SS Electives

4 Language Courses

1 Free Elective

Course Matrix - History (HHS)

3/C Fall	3/C Spring	2/C Fall	2/C Spring	1/C Fall	1/C Spring
	NE203 3-0-3	NL310 3-0-3	NS300 1-2-2		NS43X 1-2-2
	NN220 1-2-2	SM2XY 3-0-3	HM SS1 3-0-3	EW300 3-0-3	HMSS2 3-0-3
SP211 3-2-4	SP212 3-2-4	EC310 2-2-3	EE301 3-2-4	EW370 0-2-1	NL400 2-0-2
SM223 4-0-4				EM300 3-2-4	EA/N4XY 3-2-4
HH2XY 3-0-3	HH216 3-0-3			FR EL 3-0-3	
FL101 3-0-3	FL102 3-0-3	FL201 3-0-3	FL202 3-0-3		
HH200 3-0-3		HH300 3-0-3		HH400X 3-0-3	
			EL3 RE 3-0-3	EL5 ML 3-0-3	MJ EL6 3-0-3
	EL1 AM 3-0-3	EL2 EU 3-0-3	EL4 TH 3-0-3		MJ EL7 3-0-3
17	18	18	18	17	17

Total credits: 140

This major has an honors track (HHSH, 141 credits).

Political Science (FPS)

The Discipline and the Major

The political science major offers a full complement of undergraduate courses designed for midshipmen to learn about political institutions and behavior. Students in political science study the three primary subfields of political science--international relations, comparative politics and American politics. These concentrations introduce midshipmen to the various aspects of the discipline which include regional studies (Asia, Latin America, Middle East, Africa and Europe), political theory, law, political institutions, public policy and political behavior. Midshipmen are free to choose from a wide range of courses each semester from the three subfields (international relations, comparative politics, American politics) to fulfill the required six major electives.

The major consists of 30 credit hours in addition to the core course taken in the plebe year, United States Government and Constitutional Development (FP130). All majors take a survey course in international relations (FP210) and comparative politics (FP230) as well as political science research methods (FP220). In the first class year students write a capstone research paper as part of a capstone seminar course (FP471) supervised by a faculty seminar leader. This summative research project requires midshipmen to demonstrate knowledge of facts and method, much as you might be required to do in your professional career. For those interested in advanced studies, the department offers an honors program with a designated honors degree.

Opportunities

Many courses include field trips to governmental and political institutions such as the White House, Capitol Hill, the Supreme Court of the United States, think tanks, and embassies in Washington, D.C.. The department offers lectures by prominent speakers and typically has visiting scholars who are active in government or private sector positions of authority. Congress to Campus brings members of Congress into the classroom each semester to provide midshipmen with a unique, real-world perspective. Many political science majors participate in the Naval Academy Foreign Affairs Conference (NAFAC), a four day undergraduate conference each April that is organized by midshipmen. NAFAC is the oldest and largest undergraduate foreign affairs conference in the nation. Summer internships both in the Washington D.C. area (State Department, Pentagon) and abroad (Cambridge Security Initiative in the U.K.) are directed by faculty advisers who bridge real world experience with academic acumen.

Considerations for those who might be interested in this major

Midshipmen graduating with a Bachelor of Science degree in Political Science gain an important understanding of their domestic and global political environments along with the necessary technical and strategic competence to excel in the fleet and beyond. The major is writing intensive, capitalizing on critical reasoning skills and analytical presentation which are in high demand in the fleet and in the civilian sector.

Course Requirements Beyond the Core - Political Science (FPS)

FP210 International Relations (3-0-3)

FP220 Political Sci Research Methods (3-0-3)

FP230 Comparative Politics (3-0-3)

FP471 Capstone Seminar (3-0-3)

6 Major Electives

4 Language Courses

2 HUM/SS Electives

1 Free Elective

Course Matrix - Political Science (FPS)

3/C Fall		3/C Spring		2/C Fall		2/C Spring		1/C Fall		1/C Spring	
NN220	1-2-2			NS300	1-2-2	NL310	3-0-3	NL400	2-0-2	NS43X	1-2-2
SP211	3-2-4	SP212	3-2-4								
SM223	4-0-4	SM2XY	3-0-3	EC310	2-2-3	EE301	3-2-4	EW300	3-0-3		
NE203	3-0-3					EM300	3-2-4	EW370	0-2-1	EA/N4XY	3-2-4
		HH2XY	3-0-3	HH216	3-0-3			HM SS1	3-0-3	HMSS2	3-0-3
								FR EL	3-0-3		
FL101	3-0-3	FL102	3-0-3	FL201	3-0-3	FL202	3-0-3				
FP210	3-0-3	FP230	3-0-3	FP220	3-0-3	MJ EL3	3-0-3	MJ EL4	3-0-3	FP471	3-0-3
		MJ EL1	3-0-3	MJ EL2	3-0-3			MJ EL5	3-0-3	MJ EL6	3-0-3
19		19		17		17		18		15	

Total credits: 140

This major has an honors track (FPSH, 143 credits).

Quantitative Economics (FQE)

The Discipline and the Major

Economics is the social science that studies the behaviour and interactions of economic agents. In particular economics examines the production, distribution, and consumption of goods and services.

The Quantitative Economics major produces graduates who can think critically, and who can understand, explain, and apply the core principles and quantitative methods of economics to resource allocation problems, the functioning of economic institutions, and the decisions of policy makers and other economic agents within a society.

The major consists of 42 credit hours divided into a core theory curriculum, an econometric series, a selection of electives, and a capstone research seminar. All majors take principle and intermediate-level theory courses in microeconomics and macroeconomics. The three-course econometric series introduces statistical methods and teaches quantitative analysis of economic phenomena. In the first-class year, students write a capstone research paper supervised by a faculty seminar leader. As the final course in the Quantitative Economics major sequence, this research seminar integrates material from multiple courses in the major, promotes the review of relevant economics literature, encourages empirical testing of economic theories, and provides a forum for presenting research findings.

Opportunities

Major electives in the FQE matrix provide flexibility for students to pursue complementary interests in economic theory, finance and accounting, mathematics, languages, or other related fields by department chair approval. Quantitative Economics majors often choose to minor in a language or participate in study abroad. Internships are available in Washington, D.C. at the Pentagon or at the U.S. International Development Finance Corporation (DFC). Advanced students with a strong interest in research may elect to complete the department's Honors program, which involves working one-on-one with a faculty mentor to complete a required Honors research project. Many students in the past have also participated in a well-established summer program completing coursework at the London School of Economics.

Considerations for those who might be interested in this major

There are important reasons for a midshipman to major in Quantitative Economics. First, the most fundamental lesson of economics is that resources are scarce relative to potential uses, so that choices must be made -- that is what it means to "think economically." The Naval Officer can invariably say that "...if I had more people, or more ships, or more planes, or more supplies, or more time, the task would be easy," but of course the officer doesn't live in that kind of world. Instinctively thinking in terms of alternative uses of scarce resources -- thinking economically -- tends to make an effective officer. Second, an economics program provides understanding of the economic institutions and economic system each officer is pledged to defend. Third, an officer operates in an international arena. Knowledge of world resource endowments, industrial patterns, trade flows, and the nature and the interdependency of the world's diverse economic systems is a useful background for dealing with the citizens and representatives of other countries that U.S. officers will inevitably encounter. The Quantitative Economics major provides a strong set of mid-career skills. In particular, it prepares a midshipman well for (1) attendance at service schools such as the Naval War College, (2) staff billet assignments on fleet, joint and combined staffs, (3) postgraduate training in management, national security affairs, and intelligence, and (4) future subspecialty designations in management and politico-military or strategic planning. In short, there are plenty of reasons why having a Quantitative Economics major is useful to a Naval Officer.

Course Requirements Beyond the Core - Quantitative Economics (FQE)

SE201 Principles of Microeconomics (3-0-3)SE202 Principles of Macroeconomics (3-0-3)

SM275 Mathematical Methods for Econ (3-0-3)

SE312 Macroeconomics (3-0-3)

SE331 Economic Statistics (2-2-3)

SE341 Microeconomics (3-0-3)

SE445 Econometrics (3-0-3)

SE475 Research Seminar in Econ (3-0-3)

3 Economics Electives

2 Major Electives

1 Restricted Elective

1 Free Elective

Course Matrix - Quantitative Economics (FQE)

3/C Fall		3/C Spring		2/C Fall		2/C Spring		1/C Fall		1/C Spring	
NE203	3-0-3	NN220	1-2-2	NL310	3-0-3	NS300	1-2-2	NL400	2-0-2	NS43X	1-2-2
SM223	4-0-4	SM2XY	3-0-3								
SP211	3-2-4	SP212	3-2-4							EW300	3-0-3
				EE301	3-2-4	EC310	2-2-3			EW370	0-2-1
		HH2XY	3-0-3	HH216	3-0-3	HM SS1	3-0-3	HM SS2	3-0-3		
						EM300	3-2-4	EA/N4XY	3-2-4	FR EL	3-0-3
SE201	3-0-3	SE202	3-0-3	SE312	3-0-3	SE445	3-0-3	RS EL1	3-0-3	SE475	3-0-3
SM275	3-0-3	SE341	3-0-3	SE331	2-2-3	FE EL1	3-0-3	FE EL2	3-0-3		
				MJ EL1	3-0-3			FE EL3	3-0-3	MJ EL2	3-0-3
17		18		19		18		18		15	

Total credits: 140

This major has an honors track (FQEH, 146 credits).

School of Mathematics & Science

The School of Mathematics & Science provides midshipmen the opportunity to gain knowledge and skills in Mathematics and Science to become aspiring naval officers. The core courses of Mathematics, Chemistry, Cyber Science and Physics are taught to all midshipmen to aid in their understanding of the universal scientific principles basic to modern technology and to enable them to succeed in any of the Academy's technical majors. The School also provides the full educational value of majors for those midshipmen who choose to specialize in the fields of Chemistry, Computer Science, Cyber Science, Data Science, Mathematics, Oceanography, Operations Research or Physics.

The School of Mathematics & Science offers the following majors and tracks:

Chemistry	SCH
Biochemistry	SCB
Computer Science	SCS
Cyber Operations	SCY
NSA CAE-CO Track	SCYN
Data Science	SDS
General Science	SGS
Information Technology	SIT (not available beyond 2024)
Mathematics	SMA
Mathematics with Honors	SMAH
Applied Mathematics	SMP
Applied Mathematics with Honors	SMPH
Mathematics with Economics	SME
Ocean and Atmospheric Sciences	SOC
Oceanography with Honors	SOCH
Operations Research	SMO
Operations Research with Honors	SMOH
Physics	SPH
Physics with Honors	SPHH
Applied Physics	SPA
Astrophysics	SPAA

Chemistry (SCH)

The Discipline and the Major

Chemistry is the study of the composition, structure and properties of matter on the atomic and molecular level and the investigation of the laws that govern changes in matter. It is sometimes called “The Central Science” because it touches virtually every aspect of our lives. Agriculture, biology, environmental science, forensics, material science, explosives, propellants and medicine (to name a few) are fundamentally based on chemistry.

Now is an especially exciting time to study chemistry. Advances in our ability to manipulate molecules and even atoms (nanotechnology) will lead to faster and more efficient devices. The Human Genome Project and biotechnical advances have led to a molecular-level understanding of disease and possible treatments. New materials, with unusual optical, electrical or mechanical properties are constantly being developed and used in a host of military and civilian applications. Chemistry will play a key role as the nation and society transition from a fossil fuel-based economy in the coming century.

The chemistry major at the Naval Academy provides midshipmen with training in all of the discipline’s traditional fields, leading to a bachelor of science degree certified by the American Chemical Society. All chemistry majors take courses in organic, inorganic, analytical, physical and biochemistry. In addition to the required courses, midshipmen may take advanced courses in each of these subject areas along with other specialized areas such as polymer chemistry, environmental chemistry, and medicinal chemistry. Midshipmen in the chemistry major will develop the ability to make critical observations, keep accurate records, conduct and explain scientific research, and solve modern scientific problems.

Opportunities

Individual laboratory capstone or research projects during the 1st class year enable midshipmen to investigate topics of personal interest to them under the guidance of a faculty member. Many chemistry majors travel to present the results of their work at regional or national chemistry meetings. Each year majors participate in medical and other internships, the service academy exchange program, become Trident scholars, and occasionally begin a graduate education program. The chemistry faculty possesses a wealth of experience, not only in their academic understanding of chemistry, but also in practical applications of chemistry in the Navy and Marine Corps. The chemistry major gives midshipmen a solid background in scientific principles required for any of the technical disciplines in which they will work as naval officers. It also provides an excellent academic base for graduate studies in such diverse fields as medicine, oceanography, operations research, management and engineering.

Considerations for those who might be interested in this major

Chemistry is an experimental science and the major involves a significant amount of laboratory and hands-on work with sophisticated scientific instruments. A solid foundation in math and a curiosity about how things work at the molecular level is necessary. Chemistry offers challenging and fulfilling career opportunities to people with inquisitive minds who are creative, persistent, interested in solving problems, think independently, work well with details, have keen powers of observation and follow logical paths of reasoning. Chemistry can be both an independent and collaborative science, so self-discipline and teamwork are both important. Chemistry majors have participated in brigade leadership at all levels, in all varsity and club sports, and all other midshipmen activities and groups.

Course Requirements Beyond the Core - Chemistry (SCH)

SC216 Analytical Chemistry (3-0-3)

SC225 Organic Chemistry I (3-0-3)

SC226 Organic Chemistry II (3-0-3)

SC261 Integrated Lab I (0-6-2)

SC262 Integrated Lab II (0-6-2)

SC335 Biochemistry (3-0-3)

SC345 Physical Chemistry I (3-0-3)

SC346 Physical Chemistry II (3-0-3)

SC356 Inorganic Chemistry (4-0-4)

SC361 Integrated Lab III (1-6-3)

SC364 Integrated Lab IV (1-6-3)

SC472 Chemistry Seminar (1-0-1)

SC476 Capstone Project (0-6-3)

2 Major Electives

Course Matrix - Chemistry (SCH)

3/C Fall	3/C Spring	2/C Fall	2/C Spring	1/C Fall	1/C Spring
NN220 1-2-2	NE203 3-0-3	NS300 1-2-2	NL310 3-0-3	NL400 2-0-2	NS43X 1-2-2
				EW300 3-0-3	
SP211 3-2-4	SP212 3-2-4			EW370 0-2-1	
SM223 4-0-4	SM212 4-0-4	EC310 2-2-3	EE301 3-2-4	HM SS1 3-0-3	
HH2XY 3-0-3				HH216 3-0-3	HM SS2 3-0-3
		FR EL, 3		EM300 3-2-4	EA/N4XY 3-2-4
					SC472 1-0-1
SC225 3-0-3	SC226 3-0-3	SC335 3-0-3	SC356 4-0-4		SC476 0-6-3
	SC216 3-0-3	SC345 3-0-3	SC346 3-0-3	MJ EL1, 3	MJ EL2, 3
SC261 0-6-2	SC262 0-6-2	SC361 1-6-3	SC364 1-6-3		
18	19	17	17	19	16

Total credits: 141

Course Requirements Beyond the Core - Chemistry, Biochemistry Track (SCB)

SC216 Analytical Chemistry (3-0-3)

SC225 Organic Chemistry I (3-0-3)

SC226 Organic Chemistry II (3-0-3)

SC261 Integrated Lab I (0-6-2)

SC262 Integrated Lab II (0-6-2)

SC335 Biochemistry (3-0-3)

SC336 Biochemistry II (3-0-3)

SC345 Physical Chemistry I (3-0-3)

SC346 Physical Chemistry II (3-0-3)

SC356 Inorganic Chemistry (4-0-4)

SC361 Integrated Lab III (1-6-3)

SC364 Integrated Lab IV (1-6-3)

SC472 Chemistry Seminar (1-0-1)

SC476 Capstone Project (0-6-3)

2 Bio Electives

1 Major Elective

Course Matrix - Chemistry, Biochemistry Track (SCB)

3/C Fall		3/C Spring		2/C Fall		2/C Spring		1/C Fall		1/C Spring	
NN220	1-2-2			NS300	1-2-2	NL310	3-0-3	NL400	2-0-2	NS43X	1-2-2
NE203	3-0-3							EW300	3-0-3		
SP211	3-2-4	SP212	3-2-4	HM SS1	3-0-3			EW370	0-2-1		
SM223	4-0-4	SM212	4-0-4	EC310	2-2-3	EE301	3-2-4			HH216	3-0-3
		HH2XY	3-0-3							HMSS2	3-0-3
								EM300	3-2-4	EA/N4XY	3-2-4
						BIO EL1, 3		BIO EL2, 3		SC472	1-0-1
SC225	3-0-3	SC226	3-0-3	SC335	3-0-3	SC356	4-0-4			SC476	0-6-3
		SC216	3-0-3	SC345	3-0-3	SC346	3-0-3	MJ EL1, 3		SC336	3-0-3
SC261	0-6-2	SC262	0-6-2	SC361	1-6-3	SC364	1-6-3				
18		19		17		20		16		19	

Total credits: 143

Computer Science (SCS)

The Discipline and the Major

Computer science is the study of the theory and application of computational algorithms and information processing in computer systems. The computer science major provides a foundation in computer architecture, systems programming, data structures, and networks. Upper level courses include computer algorithms, software engineering and programming languages. Elective courses in areas such as artificial intelligence, computer security, machine learning, high performance computing, robotics, and computer graphics complete the major.

Midshipmen participate in hands-on projects beginning with third class year and the program culminates in a capstone design experience. This provides a relevant, practical opportunity to incorporate the knowledge gained into a culminating project. The capstone project can be interdisciplinary, with teams made up of computer science and other majors. Recent projects have included developing the USNA Honor website, developing apps for mobile devices and designing a system to allow the Naval Academy radio station to broadcast on the internet.

The Computer Science Department is equipped with Windows and Unix computers, networking, robotics, and computer forensics labs. Midshipmen utilize these resources to apply theory learned in the classroom and to complete projects throughout the curriculum.

Opportunities

Upper class computer science majors may engage in independent study, or participate in summer internships with the National Security Agency, the Defense Information Systems Agency, the Naval Research Labs, as well as private companies like Lockheed Martin and Rebellion Defense. Annually, select computer science majors participate in the National Security Agency Cyber Exercise (NCX) as part of USNA's Cyber Security Team (CST).

Computer science graduates can be selected into the highly competitive Information Warfare Community (IWC), and are particularly well suited to serve as Cryptologic Warfare Officers conducting Signals Intelligence, Electronic Warfare, and Cyberspace Operations; Cyber Warfare Engineers developing offensive and defensive cyber capabilities; or Information Professionals operating and defending Navy networks and communication systems. Software engineering and other computer science related fields are one of the fastest growing industries in the United States. A degree in computer science can lead to a highly successful career in the Navy and Marine Corps, or in the government and private sectors.

Considerations for those who might be interested in this major

Midshipmen considering the computer science major should have a strong interest in computer technology, and a desire to learn about its design and application. Students will spend a significant amount of time in labs working with computers, servers, routers, switches, and other computer equipment. Students who enjoy working with computers, who have a yearning to understand how computers work, who want to understand how programming languages are structured, or who have a systematic way of thinking have the greatest success in the major. No prior computer programming experience is required to be successful in this major.

Course Requirements Beyond the Core - Computer Science (SCS)

IC210 Intro to Computing (3-2-4)
 IC211 Object Oriented Programming (2-2-3)
 IC220 Computer Arch & Org (3-0-3)
 IC221 Systems Programming (2-2-3)
 IC312 Data Structures (3-0-3)
 IC322 Computing Ntwks (2-2-3)
 IC411 Operating Systems (3-0-3)
 IC470 Software Engineering (2-2-3)
 IC480 Research Sem/ Capstone (1-4-3)
 SI242 Discrete Structures for Computing (2-2-3)
 SI335 Computing Algorithms (3-0-3)
 SI342 Theory of Computing (4-0-4)
 SI413 Programming Language (2-2-3)
 3 Major Electives

Course Matrix - Computer Science (SCS)

3/C Fall	3/C Spring	2/C Fall	2/C Spring	1/C Fall	1/C Spring
NN220 1-2-2	NE203 3-0-3	NS300 1-2-2	NL310 3-0-3	NL400 2-0-2	NS43X 1-2-2
SP211 3-2-4	SP212 3-2-4		SM239 3-0-3		EW300 3-0-3
SM223 4-0-4		HH216 3-0-3	EE301 3-2-4		EW370 0-2-1
	HH2XY 3-0-3	HM SS1 3-0-3	HMSS2 3-0-3		
				EM300 3-2-4	EA/N4XY 3-2-4
IC210 3-2-4	IC211 2-2-3	IC312 3-0-3	SI335 3-0-3	SI413 2-2-3	IC480 1-4-3
SI242 2-2-3	IC220 3-0-3	IC322 2-2-3		IC470 2-2-3	
	IC221 2-2-3	SI342 4-0-4		IC411 3-0-3	
			MJ EL1, 3	MJ EL2, 3	MJ EL3, 3
17	19	18	19	18	16

Total credits: 142

Cyber Operations (SCY)

The Discipline and the Major

Per existing National Security directives, Cyberspace is “a global domain within the information environment consisting of the interdependent network of information technology infrastructures, including the internet, telecommunications networks, computer systems, and embedded processors and controllers ...common usage of the term also refers to the virtual environment of information and interactions between people.” Cyber Operations is an *interdisciplinary* major that covers the entire scope of cyberspace and related operations, both technical and non-technical. As such, the Cyber Operations major provides a basic foundation in computer architecture, programming, data structures, networks, internet, database systems, information assurance, cryptography, and forensics. The technical aspects of the program are balanced with additional courses and electives emphasizing applications in areas such as policy, law, ethics, and human factors in cyber operations. After completing the Cyber Operations program at the Naval Academy, Cyber Operations graduates are not limited or predisposed to any specific warfare speciality. All military units need officers who understand the complexity of the cyber domain. A select number of Cyber Operations majors may be selected for advanced study in related disciplines or possibly assigned to various military Cyber forces in support of national security, while the majority select aviation, submarines, surface and USMC for example. Midshipmen will participate in hands-on cyber operations beginning third class year and the program culminates in fully immersed cyber operations studies and simulations in the first class year. The Cyber Operations major was designated a National Security Agency Center of Academic Excellence in Cyber Operations in 2020.

Opportunities

Upper class Cyber Operations majors may engage in independent study, participate in summer internships with government organizations such as the National Security Agency, the Defense Information Systems Agency, Defense Intelligence Agency, or the Naval Research Labs, as well as with industry. Annually, a select group of Cyber Operations majors participate with midshipmen from other majors in the National Security Agency Cyber Exercise (NCX) as part of USNA’s Cyber Security Team (CST). Foreign travel designed to expand awareness of international cyber operations and cyber security may also be possible. All eligible Cyber Operations midshipmen can be processed for Top Secret/Sensitive Compartmented Information (TS/SCI) clearances after their 3/C year.

Cyber Operations graduates can be selected into the highly competitive Information Warfare Community (IWC), and are particularly well suited to serve as Cryptologic Warfare Officers conducting Signals Intelligence, Electronic Warfare, and Cyberspace Operations; Cyber Warfare Engineers developing offensive and defensive cyber capabilities; or Information Professionals operating and defending Navy networks and communication systems. Cyber Security and Cyber Operations are one of the fastest growing industries and fields in the United States. A degree in Cyber Operations can lead to a highly successful career in the Navy and Marine Corps, or in the government and private sectors.

Considerations for those who might be interested in this major

Midshipmen considering the Cyber Operations major should have a strong interest in computer and information technology as it applies to cyberspace, networks, and the use of the internet; performance and aptitude in mathematics, sciences, and in Cyber Security I (SY110) are among the indicators for success in the major. Students will receive a strong foundation working with computers, servers, routers, and other computer equipment, but will also gain awareness of the politics, ethics, legalities of cyber operations, as well as what drives the social aspect of cyber operations. Students who enjoy working with systems of computers, who have an interest in the technical foundation for computer and network security, or who have a systematic way of thinking, have the greatest success in the major. No prior computer programming experience is required to be successful in this major.

Course Requirements Beyond the Core - Cyber Operations (SCY)

SY201 Cyber Fundamentals (3-2-4)

SY202 Cyber Systems Engineering (2-2-3)

SY202 Systems Programming & Operating Systems Fundamentals (2-2-3)

SY301 Data Structures for Cyber Operations (3-2-4)

SY303 Cyber Systems Architecture (3-2-4)

SY304 Human Factors in Cyber Operations (3-0-3)

SY306 Web & Database Security for Cyber Operations (2-2-3)

SY308 Security Fundamental Principles (3-0-3)

SY310 Intro to Networking & Wireless Communications (3-2-4)

SY401 Cyber Operations I (2-2-3)

SY402 Cyber Operations II (2-2-3)

SY403 Cyber Planning and Policy (3-0-3)

SY406 Cyber Law and Ethics (3-0-3)

SY4XX Advanced Topics in Cyber Science (3-0-3)

SY4XY Independent Research in Cyber Science (0-6-3)

Course Matrix - Cyber Operations (SCY)

3/C Fall		3/C Spring		2/C Fall		2/C Spring		1/C Fall		1/C Spring	
NE203	3-0-3	NN220	1-2-2	NS300	1-2-2	NL310	3-0-3	NL400	2-0-2	NS43X	1-2-2
SP211	3-2-4	SP212	3-2-4								
SM223	4-0-4	SM242	4-0-4	EE301	3-2-4			EW300	3-0-3		
HH2XY	3-0-3	HH216	3-0-3	HM SS1	3-0-3	HMSS2	3-0-3				
								EM300	3-2-4	EA/N4XY	3-2-4
SY201	3-2-4	SY202	2-2-3	SY301	3-2-4	SY304	3-0-3	SY403	3-0-3	SY406	3-0-3
		SY204	3-2-4	SY303	3-2-4	SY306	2-2-3				
						SY308	3-0-3	SY4XX	3-0-3	SY4XY	0-6-3
						SY310	3-2-4	SY401	2-2-3	SY402	2-2-3
18		20		17		19		18		15	

Total credits: 142

Course Requirements Beyond the Core - Cyber Operations, NSA Center of Academic Excellence in Cyber Operations (CAE-CO) Track, (SCYN)

SY201 Cyber Fundamentals (3-2-4)
 SY202 Cyber Systems Engineering (2-2-3)
 SY202 Systems Programming & Operating Systems Fundamentals (3-2-4)
 SY205 Cyber Networking Intro (0-4-2)
 SY301 Data Structures for Cyber Operations (3-2-4)
 SY303 Cyber Systems Architecture (3-2-4)
 SY304 Human Factors in Cyber Operations (3-0-3)
 SY306 Web & Database Security for Cyber Operations (2-2-3)
 SY308 Security Fundamental Principles (3-0-3)
 SY312 Digital & Mobile Communications (3-2-4)
 SY401 Cyber Operations I (2-2-3)
 SY402 Cyber Operations II (2-2-3)
 SY403 Cyber Planning and Policy (3-0-3)
 SY406 Cyber Law and Ethics (3-0-3)
 SY416 Reverse Engineering (2-2-3)
 IC411 Operating Systems (3-0-3)

Course Matrix - Cyber Operations, NSA Center of Academic Excellence in Cyber Operations (CAE-CO) Track

3/C Fall		3/C Spring		2/C Fall		2/C Spring		1/C Fall		1/C Spring	
NE203	3-0-3	NN220	1-2-2	NS300	1-2-2	NL310	3-0-3	NL400	2-0-2	NS43X	1-2-2
SP211	3-2-4	SP212	3-2-4								
SM223	4-0-4	SM242	4-0-4	EE301	3-2-4			EW300	3-0-3		
HH2XY	3-0-3	HH216	3-0-3	HM SS1	3-0-3	HMSS2	3-0-3				
								EM300	3-2-4	EA/N4XY	3-2-4
SY201	3-2-4	SY202	2-2-3	SY301	3-2-4	SY304	3-0-3	SY403	3-0-3	SY406	3-0-3
		SY204	3-2-4	SY303	3-2-4	SY306	2-2-3				
						SY308	3-0-3	IC411	3-0-3	SY416	2-2-3
SY205	0-4-2					SY312	3-2-4	SY401	2-2-3	SY402	2-2-3
20		20		17		19		18		15	

Total credits: 144

Data Science (SDS)

The Discipline and the Major

Data Science is an interdisciplinary field that combines the theory of data analysis with the power of today's computer systems, and applies this core to broad disciplines and modern challenges facing the Fleet. The Naval Academy needs to graduate officers who can make decisions from data, and this major puts you on that in-demand path. The major includes a core foundation rooted in computation with topics from both mathematics and computer science, and then offers electives from a variety of academic departments. The mathematics focus includes probability, statistics, and inference. The computation focus includes computer programming, data storage, visualization, machine learning, and cloud computing.

Midshipmen participate in hands-on data-driven projects throughout the curriculum. Third class year begins with a sequence of courses that introduce the student to computer programming and statistics essentials, setting up the entire major to be filled with engaging applications to real-world data. The major assumes students have not previously seen computer code nor statistics. After establishing a foundation in probability, statistics, and practical computer programming skills, the major allows for several electives that will be offered from a range of departments, such as Oceanography, Electrical Engineering, and Economics. This results in a unique field of study where Data Science majors can apply their skills to individual domains of interest.

The Computer Science Department is equipped with lots of computer labs, visual displays, and access to advanced computing facilities. Midshipmen utilize these resources to apply theory learned in the classroom and to complete projects throughout the curriculum.

Opportunities

Upper class Data Science majors may engage in independent study, research, or participate in many summer internships. Expected summer internships will be with government agencies like the National Security Agency, the Defense Information Systems Agency, and Naval Research Labs, as well as private companies like Lockheed Martin and Rebellion Defense. Students majoring in Data Science can pursue foreign language minors, exchange programs, and study abroad programs across the world.

Data Science graduates will be competitive across all service selections, as data-driven decision-making is a critical skillset that becomes more important with each passing day. The Fleet has a big data problem, and officers who can produce insights from seemingly endless data will lead the way forward.

Considerations for those who might be interested in this major

Midshipmen considering the Data Science major should have a strong interest in logical thinking, exploration, treasure hunts (finding nuggets hidden in data!), and of course computer technology. Students will take multiple courses on computer programming, and while no experience is assumed, a basic interest in programming is required to succeed. Students who enjoy solving puzzles and working with computers will have the greatest success in the major.

Course Requirements Beyond the Core - Data Science (SDS)

SD211 Data Science & Programming I (3-2-4)

SD212 Data Science & Programming II (3-2-4)

SD311 Data Structures & Scalability (3-0-3)

SD312 Machine Learning (2-2-3)

SD321 Data Storage (2-2-3)

SD322 Human Data Interaction (2-2-3)

SD411 Big Data Computing (2-2-3)

SD475 Data Science Capstone (2-2-3)

SM263 Applied Linear Algebra (3-0-3)

SM317 Statistical Learning (3-0-3)

2 Major Electives

2 Restricted Electives

Course Matrix - Data Science (SDS)

3/C Fall		3/C Spring		2/C Fall		2/C Spring		1/C Fall		1/C Spring	
NE203	3-0-3	NN220	1-2-2	NL310	3-0-3	NS300	1-2-2	NL400	2-0-2	NS43X	1-2-2
SP211	3-2-4	SP212	3-2-4	EE301	3-2-4	EC310	2-3-3			EW300	3-0-3
SM223	4-0-4	SM239	3-0-3			EM300	3-2-4	EA/N4XY	3-2-4	EW370	0-2-1
HH2XY	3-0-3	HH216	3-0-3	HM SS1	3-0-3			FR EL, 3		HM SS2	3-0-3
SD211	3-2-4	SD212	3-2-4	SD311	3-0-3	SD312	2-2-3	SD411	2-2-3	SD475	2-2-3
		SM263	3-0-3	SM317	3-0-3	DS EL1, 3		DS EL2, 3			
				SD321	2-2-3	SD322	2-2-3	RS EL1, 3		RS EL2, 3	
18		19		19		18		18		15	

Total credits: 142

General Science (SGS)

The Discipline and the Major

General science is, as its name suggests, not a single discipline. Rather, it draws from subject matter offered by each of the departments in the Division of Mathematics and Science. The major allows midshipmen to pursue a broad program in the field of physical applications of mathematics and science. The major consists of twelve courses of which nine are specified and three are elective. The required courses are introductory courses in general oceanography, atmospheric science, modern physics, basic programming, differential equations, the mathematics of naval tactics, underwater acoustics and sonar, biology and the philosophy of science. Two of the elective courses may be chosen from a very large menu of courses in mathematics, science and engineering for which the prerequisites are the aforementioned introductory courses. The third elective is fairly unconstrained.

Opportunities

Midshipmen who graduate from the Naval Academy having succeeded in the general science major will have a strong technical background that has prepared them well for any aspect of naval service. Some may be able to enter graduate study in more specialized programs.

Considerations for those who might be interested in this major

Very few midshipmen choose general science initially. Instead, they transfer into it after finding their initially assigned major to be a poor fit or more narrowly focused than expected. The major is designed to allow such midshipmen to complete graduation requirements in a strong science program. As described above, the structure of this major is more flexible than any of the other technical majors. In particular, courses taken previously in another technical major may count in meeting some of the requirements of general science. This should not be understood to mean that general science provides a soft path to graduation; it does not. To achieve success in the general science major requires dedication, effort, and fundamental skills in mathematics and science.

Course Requirements Beyond the Core - General Science (SGS)

SA302 Analysis of Naval Tactics (3-2-4)
 SB211 Biology for Naval Officer w/ Lab (3-2-4)
 SI200 Intro to Computing (3-2-4)
 SM212 Differential Equations (4-0-4)
 SO251 Descriptive Physical Oceanography (3-2-4)
 SO262 Physical Geography (3-0-3)
 SP301 Modern Physics (3-0-3)
 SP411 Underwater Acoustics & Sonar (3-0-3)
 2 Free Electives
 1 HM/MSE Elective
 2 MSE Electives

Course Matrix - General Science (SGS)

3/C Fall	3/C Spring	2/C Fall	2/C Spring	1/C Fall	1/C Spring
NN220 1-2-2		NS300 1-2-2	NL310 3-0-3		NS43X 1-2-2
NE203 3-0-3	HM SS1 3-0-3				NL400 2-0-2
SP211 3-2-4	SP212 3-2-4	EC310 2-2-3	EE301 3-2-4	EW300 3-0-3	
SM223 4-0-4	SM230 3-0-3			EW370 0-2-1	HM SS2 3-0-3
	HH2XY 3-0-3	HH216 3-0-3	EM300 3-2-4	EA/N4XY 3-2-4	
		FR EL1 3-0-3		FR EL2 3-0-3	
		HM/MSE1 3-0-3	SI200 3-2-4	SP411 3-0-3	SB211 3-2-4
SO251 3-2-4	SM212 4-0-4	SP301 3-0-3	SO262 3-0-3		SA302 3-2-4
				MSE EL1 3-0-3	MSE EL2 3-0-3
17	17	17	18	17	18

Total credits: 139

Information Technology (SIT)

The Discipline and the Major

Information technology is the use of computers and software to manage information. The information technology major provides a foundation in computer architecture, systems programming, data structures and networks. Upper level courses include web and internet systems, database systems, and information assurance and network security. The program is completed with electives emphasizing applications in areas such as web technology, databases, and computer security. After completing the information technology program at the Naval Academy one can go on to advanced study in databases, information assurance, and computer/network security.

Midshipmen participate in hands-on projects beginning in third class year and the program culminates in a capstone design experience in the first class year. The capstone experience provides a relevant, practical opportunity to incorporate all of the knowledge gained into a culminating project. The capstone project can be interdisciplinary, with teams made up of computer science and information technology majors. Recent projects have included developing the USNA Honor website, developing apps for mobile devices and designing the system to allow the naval Academy radio station to broadcast on the internet.

The Computer Science Department is equipped with Windows and Unix computers, networking, and computer forensics labs. Midshipmen utilize these resources to reinforce and apply the theory learned in the classroom and to complete projects throughout the curriculum.

Prospective majors take note: the Information Technology major is not available to the Class of 2025 and beyond.

Course Requirements Beyond the Core - Information Technology (SIT)

IC210 Intro to Computing (3-2-4)

IC211 Object Oriented Programming (2-2-3)

IC220 Computer Arch & Org (3-0-3)

IC221 Systems Programming (2-2-3)

IC312 Data Structures (3-0-3)

IC322 Computing Ntwks (2-2-3)

IC411 Operating Systems (3-0-3)

IC470 Software Engineering (2-2-3)

IC480 Research Sem/ Capstone (1-4-3)

IT350 Web & Internet Prgmng (2-2-3)

IT360 Applied Database Systems (2-2-3)

IT430 Computer & Network Security (2-2-3)

3 Major Electives

Course Matrix - Information Technology (SIT)

3/C Fall		3/C Spring		2/C Fall		2/C Spring		1/C Fall		1/C Spring	
NN220	1-2-2	NE203	3-0-3	NS300	1-2-2	NL310	3-0-3	NL400	2-0-2	NS43X	1-2-2
SP211	3-2-4	SP212	3-2-4	SM242	4-0-4					EW300	3-0-3
SM223	4-0-4					EE301	3-2-4			EW370	0-2-1
HH2XY	3-0-3	HH216	3-0-3	HM SS1	3-0-3	HM SS2	3-0-3				
								EM300	3-2-4	EA/N4XY	3-2-4
								FR EL	3-0-3		
IC210	3-2-4	IC211	2-2-3	IC312	3-0-3	IT360	2-2-3	IC470	2-2-3	IC480	1-4-3
		IC220	3-0-3	IC322	2-2-3	IT430	2-2-3	IC411	3-0-3		
		IC221	2-2-3	IT350	2-2-3	MJ EL1	3-0-3	MJ EL2	3-0-3	MJ EL3	3-0-3
17		19		18		19		18		16	

Total credits: 142

Mathematics (SMA)

The Discipline and the Major

Mathematics is a field that is vast and ancient. It encompasses the study of quantity, shapes, symmetries, patterns and change, among others. Mathematics is the language of science and engineering. Remarkably, the same mathematics used to solve problems in one area may be applicable in a seemingly unrelated field. Mathematicians look for generalities, use analogies and employ logic to verify conjectures.

The mathematics major has two tracks, one in pure and the other in applied mathematics designated, respectively, as Mathematics and Applied Mathematics. Both tracks offer honors versions for exceptional students. The Mathematics Department also administers a separate major in operations research and co-administers the major in math with quantitative economics described elsewhere.

Midshipmen in the pure mathematics track take seven required courses, four electives and a capstone project course. Those in the applied mathematics track take eight required courses, four electives and a capstone project course. The two tracks share a common third class year with required courses in fundamentals of mathematical reasoning, linear algebra, probability, and applied mathematics and modeling. Two additional required courses common to both tracks follow in second class year in the underpinnings of calculus (sequences, series and functions) and intermediate linear algebra. The remaining required course in the mathematics track is one in algebra which treats mathematical structures called groups, rings and fields. The remaining required courses in the applied mathematics track are an introduction to partial differential equations, and scientific computing.

By choosing the applied mathematics track, mathematics majors may create and analyze mathematical models of natural phenomena, often using a computer for simulations or computations. In the pure mathematics track, they may investigate and draw conclusions about more abstract problems which may even be unrelated to the physical world. The choice of track need not be made until the second semester of third class year. Students with both interests in both tracks may pick one track, but take electives from the other.

Opportunities

After graduation, mathematics majors are welcomed into all areas of the Navy and Marine Corps. Mathematics majors are valued in both the military and civilian worlds for their ability to reason carefully and logically. The mental training involved in learning mathematics is even more significant than any particular mathematical knowledge one acquires as an undergraduate major. As a result, midshipmen trained in mathematics may look forward to a wide range of careers inside and outside of the naval service. The first deck of Chauvenet Hall is full of small posters suggesting how advanced mathematics is useful in dozens of unexpected ways. Midshipmen majoring in mathematics will be exposed to new worlds of intrinsic interest and of great value to the Navy and Marine Corps.

Considerations for those who might be interested in this major

Good performance in prior mathematics courses is necessary for success in the mathematics major. Mathematics rewards—and demands—patience, very careful use of language, and comfort with abstraction. While the “right answer” is important in mathematics, it is even more important to know why the answer is right. Careful reasoning is a hallmark of the major. Many midshipmen who are good at mathematics but unsure about an area of specialization choose this major because it is flexible and central to so many fields. This allows them to pursue graduate study in many other areas.

It is not surprising that graduates of the Naval Academy who majored in mathematics have achieved success in mathematics, science, engineering, law, and medicine.

Course Requirements Beyond the Core - Mathematics (SMA)

SM233 Intro to Applied Math (3-0-3)

SM261 Matrix Theory (3-0-3)

SM239 Probability and Statistics I (3-0-3)

SM291 Fund. of Math (3-0-3)

SM333 Sequences, Series, & Functions (4-0-4)

SM361 Intermediate Linear (4-0-4)

SM362 Modern Algebra (3-0-3)

1 Free Elective

1 Math, Science or Engineering Elective

2 Track Electives

2 Breadth Electives

1 Project Course

Course Matrix - Mathematics (SMA)

3/C Fall	3/C Spring	2/C Fall	2/C Spring	1/C Fall	1/C Spring
	NE203 3-0-3	NL310 3-0-3	NS300 1-2-2		NS43X 1-2-2
	NN220 1-2-2			EW300 3-0-3	NL400 2-0-2
SP211 3-2-4	SP212 3-2-4	EE301 3-2-4	EC310 2-2-3	EW370 0-2-1	
SM221 4-0-4	SM222 4-0-4		HH216 3-0-3	HM SS1 3-0-3	HMSS2 3-0-3
HH2XY 3-0-3				EM300 3-2-4	EA/N4XY 3-2-4
			MSE EL 3-0-3	FR EL 3-0-3	
SM261 3-0-3	SM233 2-2-3	SM333 4-0-4			
SM239 3-0-3	SM291 3-0-3	SM361 4-0-4	BR EL1 3-0-3		BR EL2 3-0-3
		SM362 3-0-3	TRK EL1 3-0-3	TRK EL2 3-0-3	PROJ 3-0-3
17	19	18	17	17	17

Total credits: 140

This major offers an honors track (141 credit hours)

Course Requirements Beyond the Core - Mathematics, Applied Math Track (SMP)

SM233 Intro to Applied Math (3-0-3)

SM261 Matrix Theory (3-0-3)

SM239 Probability and Statistics I (3-0-3)

SM291 Fund. of Math (3-0-3)

SM315 Introduction to Partial Differential Equations (3-0-3)

SM333 Sequences, Series, & Functions (4-0-4)

SM361 Intermediate Linear (4-0-4)

SM364 Introduction to Scientific Computing (3-0-3)

1 Free Elective

2 Track Electives

2 Breadth Electives

1 Project Course

Course Matrix - Mathematics, Applied Math Track (SMP)

3/C Fall	3/C Spring	2/C Fall	2/C Spring	1/C Fall	1/C Spring
	NE203 3-0-3	NL310 3-0-3	NS300 1-2-2		NS43X 1-2-2
	NN220 1-2-2		HM SS1 3-0-3	EW300 3-0-3	NL400 2-0-2
SP211 3-2-4	SP212 3-2-4	EE301 3-2-4	EC310 2-2-3	EW370 0-2-1	
SM221 4-0-4	SM222 4-0-4		HH216 3-0-3	HMSS2 3-0-3	
HH2XY 3-0-3				EM300 3-2-4	EA/N4XY 3-2-4
					FR EL 3-0-3
SM261 3-0-3	SM233 2-2-3	SM333 4-0-4	SM364 3-0-3	TRK EL1 3-0-3	TRK EL2 3-0-3
SM239 3-0-3	SM291 3-0-3	SM361 4-0-4	BR EL1 3-0-3	BR EL2 3-0-3	
		SM315 3-0-3			PROJ 3-0-3
17	19	18	17	17	17

Total credits: 140

This major track offers an honors version (141 credit hours)

Mathematics with Economics (SME)

The Discipline and the Major

The mathematics with economics (SME) major, formerly called the quantitative economics (SQE) major, is an interdisciplinary mathematics and economics major administered by the mathematics department. The goal of this major is to produce graduates who are adept at using mathematics to understand and evaluate problems in economics. Mathematics with economics majors take five required courses and two electives in mathematics and five required courses and two electives in economics, and then a culminating capstone research course taught jointly by faculty from the mathematics and economics departments. The required mathematics courses are in probability, statistics, linear algebra, multivariable calculus, and optimization; the required economics courses are in introductory and intermediate microeconomics and macroeconomics and econometrics. A wide range of courses are available to fulfill the elective requirements, including (but not limited to) game theory, labor economics, public finance, monetary theory and policy, dynamic and stochastic models, graph and network algorithms, differential equations, logistics, and cost estimation.

Opportunities

The mathematics with economics major prepares midshipmen with the analytic and computational tools to pursue further study in economics, finance, business administration or operations analysis—disciplines that are all becoming increasingly mathematical. In the Navy or Marine Corps, a graduate from this major would be well equipped to solve problems in areas such as weapons analysis, manpower studies, decision analysis, and strategic problems. For students in this major, internships are available in the Washington, D.C. area at the Pentagon and at the U.S. International Development Finance Corporation (DFC). Also, many students have traveled to the United Kingdom to complete summer coursework at the London School of Economics.

Considerations for those who might be interested in this major

The mathematics with economics major is a good choice for midshipmen who are fascinated by economic applications and comfortable with mathematical theory and computation.

Course Requirements Beyond the Core - Mathematics with Economics (SME)

SE201 Principles of Micro (3-0-3)

SE202 Principles of Macro (3-0-3)

SE312 Macroeconomics (3-0-3)

SE341 Microeconomics (3-0-3)

SE445 Econometrics (3-0-3)

SM261 Matrix Theory (3-0-3)

SM279 Multivariable Calculus (3-0-3)

SM339 Applied Statistics I (3-0-3)

SA305 Linear Programming (3-0-3)

SA475E Mathematics with Economics Research Capstone (3-0-3)

1 Free Elective

2 Economics Electives

2 Math Electives

Course Matrix - Mathematics with Economics (SME)

3/C Fall	3/C Spring	2/C Fall	2/C Spring	1/C Fall	1/C Spring
NE203 3-0-3	NN220 1-2-2	NL310 3-0-3	NS300 1-2-2	NL400 2-0-2	NS43X 1-2-2
		SM239 3-0-3			
SP211 3-2-4	SP212 3-2-4	EC310 2-2-3	EE301 3-2-4	EW300 3-0-3	
SM223 4-0-4		HM SS1 3-0-3		EW370 0-2-1	HMSS2 3-0-3
	HH2XY 3-0-3	HH216 3-0-3	EM300 3-2-4	EA/N4XY 3-2-4	FR EL 3-0-3
	SE202 3-0-3		SM339 3-0-3	SE445 3-0-3	SA475E 3-0-3
SE201 3-0-3	SE341 3-0-3	SE312 3-0-3	SA305 3-0-3		FE EL2 3-0-3
SM261 3-0-3	SM279 3-0-3		FE EL1 3-0-3	SM EL1 3-0-3	SM EL2 3-0-3
17	18	18	19	16	17

Total credits: 140

Oceanography (SOC)

The Discipline and the Major

The oceanography major is designed for the “hands-on” student with a strong interest in the physical and dynamic properties of the ocean and atmosphere. Oceanography majors reinforce knowledge gained in the classroom with underway and computer laboratories and conduct current and scientifically relevant research. The faculty includes tenure-track civilian professors, rotational military instructors with recent fleet experience and permanent military professors. Oceanography majors take 13 courses in oceanography, meteorology, and applied mathematics. Students in the honors program take 14. Oceanography attracts a diverse cross-section of midshipmen that has included a Rhodes Scholar, several Trident Scholars, varsity athletes, high-ranking members of the Brigade leadership and many students whose research work has been published in professional conferences and journals. A prospective major can expect to take two courses in general oceanography and a course on the dynamics of the atmosphere during third class year. The second class year builds on these introductory courses and includes courses on atmospheric thermodynamics, quantitative methods in the science of the ocean and atmosphere and research methods if selected for honors. The list of available electives is diverse and includes geological oceanography, geographical information systems, polar oceanography, near-shore oceanography, biological oceanography, estuarine oceanography, global climate change, synoptic meteorology, tropical meteorology, and environmental remote sensing. The first class year includes required courses in waves and tides, underwater acoustics and sonar, mathematical modeling of the ocean and atmosphere and a faculty mentored capstone or honors research project.

Opportunities

Faculty-directed field and computer-based research opportunities include the retreat of glaciers associated with global climate change, the survey of century-old ship wrecks, ocean turbidity in Key West, oxygen depletion and oyster populations in the Chesapeake Bay, and wind regimes over the Andes mountains in Chile. Our robust internship program includes storm chasing over the midwest, flying through hurricanes over the Atlantic Ocean, analyzing satellite imagery of icebergs, sampling sea ice in the Bering Sea and a week in Antarctica that includes a flight to the South Pole. After graduation, oceanography majors may pursue careers in surface warfare, submarines, naval aviation, the Marine Corps (air and ground), special warfare, and other fields. Opportunities exist for immediate graduate school at the University of Rhode Island, Massachusetts Institute of Technology or Scripps Institute. After their initial tours, a few transfer into the naval oceanography community and obtain advanced degrees at the Naval Postgraduate School in Monterey, California. After transition to the public sector, employment opportunities exist in the federal government (NOAA, NSF, USGS, NASA, EPA, Department of Energy), numerous academic institutions that offer courses in oceanography and meteorology related fields, and in private industry (engineering companies, fisheries, petroleum industry and marine policy).

Considerations for those who might be interested in this major

Because the major is scientifically diverse and technologically oriented, prospective students should be inquisitive and persistent, have a strong background in mathematics and be comfortable with the use of computers. Midshipmen are attracted to the major because they are interested in the ocean or the atmosphere and want to learn the science of the Earth's environment.

Course Requirements Beyond the Core - Oceanography (SOC)

SO251 Physical Oceanography (3-2-4)

SO254 Intro to Meteorology (2-2-3)

SO264 Statistics for Ocean & Atmospheric Sciences (3-0-3)

SO335 Oceanographic & Meteorological Quantitative Method (2-2-3)

SO345 Atmospheric Thermodynamics (2-2-3)

SO351 Biogeochemical Oceanography (3-2-4)

SO414 Oceanic & Atmospheric Processes (3-2-4)

SO416 Waves & Tides (2-2-3)

SO470 Capstone Seminar (3-0-3)

SP411 Underwater Acoustics & Sonar (3-0-3)

SO470 Capstone Seminar (3-0-3)

1 Free Elective

3 Major Electives

Course Matrix - Oceanography (SOC)

3/C Fall	3/C Spring	2/C Fall	2/C Spring	1/C Fall	1/C Spring
NE203 3-0-3		NL310 3-0-3		NL400 2-0-2	NS43X 1-2-2
	NN220 1-2-2	NS300 1-2-2			
SP211 3-2-4	SP212 3-2-4	EC310 2-2-3	EE301 3-2-4		EW300 3-0-3
SM223 4-0-4	SM239 4-0-4		HM SS1 3-0-3	HMSS2 3-0-3	EW370 0-2-1
HH2XY 3-0-3	HH216 3-0-3		EM300 3-2-4	EA/N4XY 3-2-4	FR EL 3-0-3
		SO351 3-2-4	SO414 3-2-4	SO416 2-2-3	
SO251 3-2-4	SO254 2-2-3	SO335 2-2-3	MJ EL1, 3	MJ EL2, 3	MJ EL3, 3
	SO264 3-0-3	SO345 2-2-3		SP411 3-0-3	SO470 3-0-3
18	19	18	18	18	15

Total credits: 141

This major offers an honors track (144 credit hours)

Operations Research (SMO)

The Discipline and the Major

Operations research is the discipline of applying mathematical methods to study and analyze complex decision-making problems. Such decision-making problems come from all parts of everyday life, including business, healthcare, and the military. For example, delivery companies like FedEx and UPS use operations research to optimize their pickup and delivery processes, not only reducing their financial costs, but their carbon footprint as well. Hospitals such as the Mayo Clinic use operations research to schedule their operating rooms so that the surgeries for a given day can be completed without much overtime, therefore reducing medical staff fatigue and increasing patient safety. The Navy and Marine Corps use operations research to help make decisions about a wide range of issues related to force development and warfighting.

Operations research majors are required to take courses in optimization, probability, statistics, and simulation – these are the pillars of the discipline. In preparation for these courses, students in the major take foundational courses in mathematics and computer programming. The major also involves several electives: some provide depth by focusing on advanced topics or applications; others provide breadth by covering related disciplines, such as economics, computer science, and other areas of mathematics. Students in the major must also take a capstone course, in which students typically work in teams on a semester-long project that involves the application of operations research methods to a real-world decision-making problem.

Opportunities

The operations research major matrix has enough flexibility to support language minors, as well as many study abroad and exchange programs. There are also many summer internship opportunities for operations research majors, both in the military and the private sector. For those interested in advanced studies, there is an honors version of the major which involves advanced coursework and working one-on-one with a faculty member on a substantial research project. Students can also pursue individual research opportunities through the Trident Scholar and Bowman Scholar Programs.

After graduation, operations research majors will have a strong foundation for graduate study in operations research at the Naval Postgraduate School or at a civilian graduate school. Operations research majors who graduate with an overall QPR of at least 2.7 and a major QPR of at least 3.0 will receive either a Navy 3211E subspecialty code or a Marine Corps 8051 Military Occupational Specialty (MOS) code.

Individuals with training in operations research are in high demand across the military. For example, operations research faculty at USNA have worked on research projects and sponsored internships at the Office of the Chief of Naval Operations Assessment Division (OPNAV N81); USMC Operations Analysis Directorate (OAD); Commander, Naval Air Force (CNAF) Force Readiness Analytics Group (FRAG); and Joint Staff Directorate of Logistics (J4). Operations research expertise is highly sought after in the private sector as well.

Considerations for those who might be interested in this major

Midshipmen considering the operations research major should have a strong interest in using mathematics to solve real-world problems, enjoy solving mathematics problems and logic puzzles, and be comfortable with using computers as a tool. No prior computer programming experience is required to be successful in this major.

Course Requirements Beyond the Core - Operations Research (SMO)

SA233 Intro to Operations Research with Programming (2-2-3)

SA305 Linear Programming (3-0-3)

SA402 Dynamic & Stochastic Models (3-0-3)

SA405 Advanced Math Programming (3-0-3)

SA410 Applications of Search and Detection Theory (3-0-3)

SA421 Simulation Modeling (3-0-3)

SA475 Operations Research Capstone (3-0-3)

SM261 Matrix Theory (3-0-3)

SM339 Applied Statistics I (3-0-3)

1 Free Elective

1 Math Elective

2 Breadth Electives

2 Track Electives

Course Matrix - Operations Research (SMO)

3/C Fall	3/C Spring	2/C Fall	2/C Spring	1/C Fall	1/C Spring
NN220 1-2-2	NE203 3-0-3	NL310 3-0-3	NS300 1-2-2		NS43X 1-2-2
SM239 3-0-3				EW300 3-0-3	NL400 2-0-2
SP211 3-2-4	SP212 3-2-4	EC310 2-2-3	EE301 3-2-4	EW370 0-2-1	
SM223 4-0-4			HM SS1 3-0-3	HMSS2 3-0-3	
HH2XY 3-0-3	HH216 3-0-3			EM300 3-2-4	EA/N4XY 3-2-4
					FR EL 3-0-3
SM261 3-0-3	SM339 3-0-3	SA402 3-0-3	MATH EL, 3	SA421 3-0-3	SA475 3-0-3
	SA305 3-0-3	SA405 3-0-3	SA410 3-0-3		
	SA233 2-2-3	BR EL1, 3	BR EL2, 3	TRK EL1, 3	TRK EL2, 3
19	19	15	18	17	17

Total credits: 140

This major offers an honors track (142 credit hours)

Physics (SPH)

The Discipline and the Major

Physics is the study of the natural laws that govern matter and energy. The ideas of physics are at the heart of all pure sciences, applied science, and engineering disciplines. Since the modern Navy and Marine Corps rely heavily on technology, physics is extremely relevant to a career in either and provides great flexibility in career choices afterward.

All physics majors begin by selecting physics and then specialize by choosing one of three tracks during their 2/C year: physics, applied physics, or astrophysics. Sophomore year is dedicated to foundational material on kinematics, mechanics, electromagnetism, heat, light, and sound. Junior year revisits these topics with increased sophistication and introduces quantum mechanical phenomena and mathematical methods for physicists. During first class year, majors take electives of their choosing. Physics track majors take advanced quantum mechanics, thermal physics, and choose from acoustics, condensed matter, optics, or nuclear physics. Astrophysics track majors take astronomy, astrophysics, and observational astrophysics. Applied track majors generally take electives from engineering or the other sciences. Regardless of track, physics majors develop rational, analytical approaches to defining and solving problems which range from the small scales found in the nucleus of an atom to the large scales found in the galaxies of the universe.

Opportunities

All physics majors are encouraged to participate in research in their field of interest. The department has active on-site and off-site research programs in acoustics, astrophysics, condensed matter, optics, biophysics, particle physics, and nuclear physics.

Physics is a highly versatile undergraduate degree. With it, a successful student can pursue graduate education in nearly any academic field.

A physics degree opens the door to any service assignment. In the past five years, the most popular service selections have been naval aviation, nuclear propulsion, and Marine Corps. The fundamental nature of the major's subject matter gives students a solid foundation regardless of service assignment.

Considerations for those who might be interested in this major

Successful physics majors have a strong work ethic and develop proficiency in mathematics. Since physics is based on observation and measurement, it is necessary for students to become skilled in the use of laboratory equipment and the debugging of computer programs as well as the analysis required in the laboratory in their classroom work. Complex and intricate homework begins in the junior year. Teamwork is encouraged through the use of nicely-equipped student office and conference areas. Day and evening assistance by the faculty is readily available.

Course Requirements Beyond the Core - Physics (SPH)

SP221 Physical Mechanics I (3-2-4)

SP222 Electricity & Magnetism I (3-2-4)

SP226 Heat, Sound, and Light (3-2-4)

SP324 Applied Quantum Mechanics (3-2-4)

SP327 20th Century Physics (3-0-3)

SP333 Physical Mechanics II (4-0-4)

SP342 Electricity & Magnetism II (4-0-4)

SP351 Problem Solving Methods I (3-0-3)

SP352 Problem Solving Methods II (3-0-3)

SP425 Advanced Quantum Theory (3-2-4)

SP444 Thermal Physics (3-0-3)

1 Free Elective

2 Major Electives - from the approved lab-based list of electives

1 Math, Science and Engineering Elective

Course Matrix - Physics (SPH)

3/C Fall	3/C Spring	2/C Fall	2/C Spring	1/C Fall	1/C Spring
NN220 1-2-2	NE203 3-0-3	NL310 3-0-3	NS300 1-2-2		NS43X 1-2-2
HM SS1 3-0-3				EW300 3-0-3	NL400 2-0-2
SM221 4-0-4	SM212 4-0-4	EE301 3-2-4	EC310 2-2-3	EW370 0-2-1	
HH215 3-0-3	HH216 3-0-3		HM SS2 3-0-3	EM300 3-2-4	
				EA/N4XY 3-2-4	FR EL, 3
		SP327 3-0-3	SP324 3-2-4	SP425 3-2-4	
SP221 3-2-4	SP222 3-2-4	SP333 4-0-4	SP342 4-0-4		SP444 3-0-3
	SP226 3-2-4			MJ EL1, 3	MJ EL2, 3
		SP351 3-0-3	SP352 3-0-3		MSE EL, 3
16	18	17	19	19	16

Total credits: 140

This major offers an honors track (142 credit hours)

Course Requirements Beyond the Core - Physics, Applied Physics Track (SPA)

SP221 Physical Mechanics I (3-2-4)
 SP222 Electricity & Magnetism I (3-2-4)
 SP226 Heat, Sound, and Light (3-2-4)
 SP324 Applied Quantum Mechanics (3-2-4)
 SP327 20th Century Physics (3-0-3)
 SP333 Physical Mechanics II (4-0-4)
 SP342 Electricity & Magnetism II (4-0-4)
 SP351 Problem Solving Methods I (3-0-3)
 SP352 Problem Solving Methods II (3-0-3)
 5 Track Electives
 1 Free Elective

Course Matrix - Physics, Applied Physics Track (SPA)

3/C Fall	3/C Spring	2/C Fall	2/C Spring	1/C Fall	1/C Spring
NN220 1-2-2	NE203 3-0-3	NL310 3-0-3	NS300 1-2-2		NS43X 1-2-2
HM SS1 3-0-3				EW300 3-0-3	NL400 2-0-2
SM221 4-0-4	SM212 4-0-4	EE301 3-2-4	EC310 2-2-3	EW370 0-2-1	
HH215 3-0-3	HH216 3-0-3		HMSS2 3-0-3	EM300 3-2-4	
				EA/N4XY 3-2-4	FR EL 3-0-3
		SP327 3-0-3	SP324 3-2-4	TRK EL1 3-0-3	
SP221 3-2-4	SP222 3-2-4	SP333 4-0-4	SP342 4-0-4	TRK EL2 3-0-3	TRK EL4 3-0-3
	SP226 3-2-4			TRK EL3 3-0-3	TRK EL5 3-0-3
		SP351 3-0-3	SP352 3-0-3		
16	18	18	19	17	16

Total credits: 139

Course Requirements Beyond the Core - Physics, Astrophysics Track (SPAA)

SP221 Physical Mechanics I (3-2-4)
 SP222 Electricity & Magnetism I (3-2-4)
 SP226 Heat, Sound, and Light (3-2-4)
 SP247 Introduction to Astrophysics (3-0-3)
 SP324 Applied Quantum Mechanics (3-2-4)
 SP327 20th Century Physics (3-0-3)
 SP333 Physical Mechanics II (4-0-4)
 SP342 Electricity & Magnetism II (4-0-4)
 SP351 Problem Solving Methods I (3-0-3)
 SP352 Problem Solving Methods II (3-0-3)
 SP445 Astrophysics I (3-0-3)
 SP446 Astrophysics II (3-0-3)
 SP447 Observational Astrophysics (3-2-4)
 1 Free Elective
 1 Math, Science or Engineering Elective

Course Matrix - Physics, Astrophysics Track (SPAA)

3/C Fall	3/C Spring	2/C Fall	2/C Spring	1/C Fall	1/C Spring
NN220 1-2-2		NL310 3-0-3	NS300 1-2-2		NS43X 1-2-2
NE203 3-0-3					NL400 2-0-2
	HM SS1 3-0-3			HMSS2 3-0-3	EW300 3-0-3
SM221 4-0-4	SM212 4-0-4	EE301 3-2-4	EC310 2-2-3	EM300 3-2-4	EW370 0-2-1
HH215 3-0-3	HH216 3-0-3			EA/N4XY 3-2-4	FR EL 3-0-3
		SP327 3-0-3	SP324 3-2-4	SP445 3-0-3	MSE EL 3-0-3
SP221 3-2-4	SP222 3-2-4	SP333 4-0-4	SP342 4-0-4		
SP247 3-0-3	SP226 3-2-4			SP447 3-2-4	SP446 3-0-3
		SP351 3-0-3	SP352 3-0-3		
16	18	17	19	18	17

Total credits: 140

Course Descriptions

Courses in the School of Engineering and Weapons

Aerospace Engineering Department Courses (EA)

Course: EA203

Title: PRINCIPLES OF AEROSPACE ENGINEERING I

Credits: 2-2-3

Description: First of a two-course introductory sequence in the theory and practice of aeronautics and astronautics. Focus is placed on the development and application of theories relating to the study of aeronautics and atmospheric flight. This sequence prepares the beginning aerospace engineering student for future studies in either the aeronautics or astronautics track and develops engineering reasoning and problem solving practices.

Offered: Fall 2022-2023

Requisites: Prereq: SM122 or equivalent.

Course: EA204

Title: PRINCIPLES OF AEROSPACE ENGINEERING II

Credits: 2-2-3

Description: Second of a two-course introductory sequence in the theory and practice of aeronautics and astronautics. The lessons in this course emphasize topics in astronautics. This sequence prepares the beginning aerospace engineering student for future studies in either the aeronautics or astronautics track and develops engineering reasoning and problem solving practices.

Offered: Spring 2022-2023

Requisites: Prereq: EA203, SP211.

Course: EA208

Title: ENGINEERING ANALYSIS

Credits: 1-2-2

Description: This course introduces students to the MATLAB programming environment. Structured programming fundamentals are taught through the application of numerical theory and analysis to relevant engineering problems. Students learn the basics of structured programming by using MATLAB to solve solutions of systems of linear and nonlinear equations, implement techniques in numerical calculus, and use statistics to analyze and plot data.

Offered: Spring 2022-2023

Requisites: Coreq: SM212

Course: EA222

Title: MATERIALS FOR AEROSPACE ENGINEERS

Credits: 3-0-3

Description: An introductory course in materials science and engineering for aerospace engineering majors. Topics include atomic structure and microstructure of materials, physical properties of materials, and broad coverage of the processing, manufacturing, and testing methods utilized in producing materials and structures, and how to prevent failure processes. Metals, alloys, and composites common in aerospace applications are emphasized. Laboratory demonstrations and exercises used to complement and reinforce the lectures and reading assignments include composite materials manufacturing, mechanical property tests, heat treatments, fracture, fatigue, corrosion, creep, and NDE/NDI methods.

Offered:

Requisites: Prereq: EM221, SC112.

Course: EA232

Title: DYNAMICS IN AEROSPACE ENGINEERING

Credits: 3-0-3

Description: Classical vector kinematics and dynamics of particles and rigid bodies, building from one degree-of-freedom, to planar, and finally to an introduction to six degree-of-freedom problems of rigid bodies. Energy and momentum concepts and

principles are also featured. Aerospace examples and applications are emphasized to build a foundation for future study of structural dynamics and aerospace vehicle dynamics and control.

Offered:

Requisites: Prereq: EM221 or EM221. Coreq: SM212

Course: EA301

Title: AERODYNAMICS I

Credits: 3-0-3

Description: An engineering science course on the fundamentals of incompressible inviscid fluid mechanics and 2-D aerodynamics. Topics include fluid statics, flow kinematics, integral and differential forms of the governing equations, potential flow theory, and thin-airfoil theory. Applications emphasize aeronautics-relevant topics. This is the first step toward understanding the theory of flight through the atmosphere and the theory of fluid power devices, e.g., propulsion systems.

Offered: Fall 2022-2023

Requisites: Prereq: EA203, SM212.

Course: EA303

Title: WIND TUNNEL LABORATORY

Credits: 1-2-2

Description: A laboratory course in wind tunnel test techniques.

Offered: Fall 2022-2023

Requisites: Prereq: None; Coreq: EA301.

Course: EA304

Title: AERODYNAMICS II

Credits: 3-0-3

Description: This course is the second in a sequence of two courses which provides knowledge of the fundamentals of fluid mechanics and aerodynamics. Fluid mechanics as applied to the theory of flight prepare students to understand external flows over aircraft including wing design, drag build-up, and viscous phenomena. The course concludes with an introduction to modern computational fluid dynamic tools.

Offered:

Requisites: Prereq: EA301

Course: EA305

Title: AERO GAS DYNAMICS

Credits: 2-2-3

Description: This course covers essentials of fluid mechanics and thermodynamics for Astronautics Track students. Control volume analysis is used in establishing the integral forms of the conservation equations. The conservation equations are applied to one-dimensional compressible flow. Isentropic flows in converging-only and converging-diverging nozzles are covered, including normal shocks. Shock expansion theory is applied to two-dimensional supersonic flow. Effect of wall friction (Fanno flow) is analyzed. Effect of heat transfer (Rayleigh flow) is introduced.

Offered:

Requisites: Prereq: EA203, SM212. Coreq: EM319

Course: EA322

Title: STRUCTURAL MECHANICS FOR AEROSPACE ENGINEERS

Credits: 3-2-4

Description: Review of mechanics of materials. Introduction to linear elasticity, including stress and strain, generalized Hooke's law, and principal stresses. Form and function of aerospace structural components. Materials allowable, and factors and margins of safety. Flight and ground loads. Bending of beams having asymmetric cross-sections. Shear flow analyses of stress in idealized semimonocoque cross-sections. Elastic buckling of columns and thin-wall structures. Laboratory work with instrumented structures and computer work with solid modeling and finite element analysis are integrated.

Offered: Fall 2022-2023

Requisites: Prereq: EA203, EA222, EA232, SM212.

Course: EA362

Title: ASTRODYNAMICS I

Credits: 3-0-3

Description: Introduction to the principles of planetary and satellite motion. Topics include the classical two-body problem, orbital elements, orbit determination, orbit transfers and maneuvers, perturbations and atmospheric drag effects, ballistic missile trajectories, rendezvous, and lunar and interplanetary travel.

Offered: Fall 2022-2023

Requisites: Prereq: EA204

Course: EA364

Title: SPACECRAFT ATTITUDE DYNAMICS AND CONTROL

Credits: 3-0-3

Description: Rigid body attitude dynamics and control of spacecraft. Attitude description using Euler angles, direction cosine matrices, and quaternions. Coordinate transformations. Inertia properties of rigid bodies, body-centered equations of motion, torque-free motion. On-orbit environmental disturbances and their modeling. Attitude control using electromagnetic torquers, thrusters, and momentum exchange devices. Attitude control system design and simulation.

Offered:

Requisites: Prereq: EA362 Coreq: EW410

Course: EA367

Title: SPACECRAFT COMMUNICATIONS AND POWER

Credits: 3-0-3

Description: This course is intended to develop satellite communications and power fundamentals with emphasis on analog and digital communications, link and power budget analysis, and power subsystems.

Offered:

Requisites: Prereq: EA362. Coreq: EE331

Course: EA400

Title: INTRODUCTION TO AERONAUTICS

Credits: 3-2-4

Description: Introduces students to the applied science of air-breathing atmospheric flight. The course describes airplanes and how they fly from a design and application perspective. Included are topics in fluid dynamics, airfoil and wing theory, aircraft performance, stability, structures, and aircraft design.

Offered: Fall 2022-2023

Requisites: Prereq: SM122 or SM162.

Course: EA401F

Title: PERFORMANCE OF FIXED-WING AIRCRAFT

Credits: 3-0-3

Description: The basic principles for lift and drag calculations are extended to entire fixed-wing flight vehicle analysis. Topics include: Static and dynamic point performance analysis and identification of relevant flight conditions for optimized performance. Energy methods and optimum flight trajectories are introduced, as are mission analysis and assessment. Course outcomes lead to design selection criteria in EA439/440.

Offered:

Requisites: Prereq: EA303 Coreq: EA304

Course: EA401R

Title: ROTORCRAFT PERFORMANCE

Credits: 3-0-3

Description: The basic principles of fluid mechanics are extended to the analysis of rotorcraft. Rotary-wing aerodynamics analysis methods are introduced. Basic principles are applied to helicopter static and dynamic performance analyses leading to design selection criteria.

Offered:

Requisites: Prereq: EA303 Coreq: EA304

Course: EA405

Title: AEROSPACE PROPULSION - ASTRO

Credits: 2-2-3

Description: The principles of fluid mechanics and thermodynamics are applied to the problem of propulsion of aircraft and space vehicles. Propulsion performance parameters evaluation, rocket thrust chamber analysis, propellant selection to include thermochemistry fundamentals, rocket flight performance, propellant budget and mission analysis are covered. Liquid, solid and hybrid propellant design and analysis as well as electric propulsion fundamentals are presented. An overview of air-breathing propulsion capability and basic cycle analysis of ramjets and turbojets is also introduced.

Offered: Fall 2022-2023

Requisites: Prereq: EA305.

Course: EA413F

Title: AIRPLANE STABILITY AND CONTROL

Credits: 3-0-3

Description: Introduces fixed-wing airplane static and dynamic stability and control. Develops and provides the tools required to analyze and design the stability and control attributes of an airplane in preparation for capstone design courses.

Offered: Fall 2022-2023

Requisites: Prereq: EA401F or USAFA equivalent. Coreq: EW410.

Course: EA413R

Title: ROTORCRAFT STABILITY AND CONTROL

Credits: 3-0-3

Description: Rotary-wing aeromechanics analysis methods are introduced. Basic principles for rotor dynamics are extended to entire flight vehicle static and dynamic stability and control analysis.

Offered: Fall 2022-2023

Requisites: Prereq: EA401R. Coreq: EW410.

Course: EA414

Title: AIRPLANE SIMULATION AND CONTROL

Credits: 3-0-3

Description: Implementation of linear and non-linear airplane models for man-in-the-loop and batch simulation of airplane flight dynamics. Application of modern control methods to the design of airplane Stability Augmentation Systems and autopilots.

Offered: Spring

Requisites: Prereq: EA413; Coreq: EW410 or equivalent.

Course: EA417

Title: FLIGHT TEST ENGINEERING

Credits: 3-2-4

Description: A lecture and laboratory course providing practical application of aeronautics principles from prior courses in airplane performance, aerodynamics, and stability and control. Topics include engineering test planning, risk management, flight test instrumentation, test execution, data analysis, and report writing. Students will employ industry-accepted methods to conduct a limited scope flight test of a light airplane, evaluating its attributes against a mission specification, FAA certification standards, and relevant military specifications.

Offered:

Requisites: Prereq: EA401 and (EA413F or EA413R), or permission of department chair.

Course: EA424

Title: STRUCTURAL DYNAMICS

Credits: 3-0-3

Description: An introductory course in structural dynamics as applied to atmospheric flight and space flight vehicles. Topics include the analysis of free, damped and forced vibrations of systems with one or many degrees of freedom; vibrations of strings, beams and rectangular plates; matrix formulation of equations of motion; introduction to the finite element method of structural dynamic analysis.

Offered: Spring

Requisites: Prereq: EA322.

Course: EA427

Title: AERODYNAMICS III

Credits: 3-0-3

Description: An advanced course continuing the study of compressible high-speed flow including general conservation laws for inviscid flows, unsteady flow problems, numerical techniques for supersonic flows and real gas effects. Hypersonic flow.

Offered: Spring

Requisites: Prereq: EA304.

Course: EA428

Title: COMPUTATIONAL AERODYNAMICS

Credits: 3-0-3

Description: Introduction to the major numerical techniques used in computational aerodynamics. Topics include mathematical methods, boundary conditions, stability, panel methods, lattice methods, nonlinear problems, time dependent solutions and transonic flow problems.

Offered: Spring

Requisites: Prereq: EA301.

Course: EA429

Title: AEROSPACE PROPULSION - AERO

Credits: 2-2-3

Description: This course applies the fundamentals of fluid mechanics and thermodynamics to the study of air-breathing (turbojets, turbofans, and turboprops/turboshafts) and non air-breathing (rocket) air vehicle propulsion systems. Propulsive forces and performance parameters for these propulsion systems will be explored. Propeller characteristics and performance and unmanned aircraft electric propulsion systems are studied.

Offered: Fall 2022-2023

Requisites: Prereq: EA305.

Course: EA435

Title: THE AERODYNAMICS OF V/STOL AIRCRAFT

Credits: 3-0-3

Description: An advanced course covering the aerodynamics of vertical and short takeoff and landing aircraft, including fixed wing and rotary wing types, with major emphasis on the helicopter.

Offered: Spring

Requisites: Prereq: 1/C, aeronautical track major.

Course: EA439

Title: AEROSPACE SYSTEM PRELIMINARY DESIGN

Credits: 1-4-3

Description: Preliminary design of an aerospace system in a team environment. Includes performance and stability analysis, structural design and systems integration. When followed by EA440, this course provides a two-semester capstone engineering design sequence.

Offered: Fall 2022-2023

Requisites: Prereq: 1/C standing in Aeronautics Track or Department Chair approval. Coreq: EA413, EA429.

Course: EA440

Title: AEROSPACE SYSTEM DESIGN

Credits: 1-4-3

Description: Design of an aerospace system in a team environment. Includes performance and stability analysis, structural design and systems integration. When preceded by EA439, this course provides a two-semester capstone engineering design sequence.

Offered:

Requisites: Prereq: 1/C standing in Aeronautics Track or Department Chair approval.

Course: EA450

Title: DRAFTING AND ADDITIVE MANUFACTURING

Credits: 3-0-3

Description: Introduces the engineering language of drafting, both by hand as well as in Computer Aided Design software. Current additive manufacturing technologies and their applications are introduced. Engineering design, drafting, and rapid prototyping skills are then utilized in a project-based learning environment with potential for tangible contribution to the operating forces.

Offered:

Requisites:

Course: EA460

Title: HUMAN SPACEFLIGHT

Credits: 3-0-3

Description: An understanding of the history, requirements, challenges, accomplishments, strategy, architecture, and future opportunities regarding human spaceflight.

Offered:

Requisites:

Course: EA461

Title: SPACE ENVIRONMENT

Credits: 3-0-3

Description: Introduction to the environment of the upper atmosphere, near Earth space, and interplanetary space. Topics include: properties of the upper atmosphere and ionosphere, the geomagnetic field, radiation belts and magnetosphere of the Earth, the solar wind and interplanetary medium, remote sensing of the atmosphere and oceans, environmental implications for spacecraft design.

Offered: Fall 2022-2023

Requisites: Prereq: SP212.

Course: EA462

Title: ASTRODYNAMICS II

Credits: 3-0-3

Description: Advanced topics in astrodynamics including potential of an arbitrary body and of the earth, orbit determination from observations including numerical techniques for data smoothing, special and general perturbations of orbits and interplanetary trajectories, drag effects on low altitude orbits. Special projects.

Offered: Fall

Requisites: Prereq: EA362.

Course: EA463

Title: SPACE OPERATIONS

Credits: 3-0-3

Description: This course investigates the relationship between mission operations and the other elements of a space mission. It defines a process for translating mission objectives and requirements into a viable mission operations concept. The course focuses on how we get information to and from space and then to the user in a usable format.

Offered: Spring

Requisites: Prereq: EA362.

Course: EA467

Title: SPACECRAFT SYSTEM LABORATORY

Credits: 0-4-2

Description: Laboratory analysis of the major system elements of space systems to include ground control and power, attitude control, communications, propulsion and thermal control. Constraints imposed by system application launch vehicles, and environment are considered. Introduction to the engineering design process as well as its computer adaptations.

Offered: Fall 2022-2023

Requisites: Prereq: None; Prereq: EA367.

Course: EA469

Title: SPACE SYSTEM DESIGN I

Credits: 1-4-3

Description: Preliminary design of an aerospace system in a team environment. Includes mission objectives definition, system requirements development and conceptual and detailed design using systems engineering practices, design iteration, and prototyping. When followed by EA470, this course provides a two-semester capstone engineering design sequence.

Offered: Fall 2022-2023

Requisites: Prereq: 1/C standing in Astronautics Track or Department Chair Approval.

Course: EA470

Title: SPACE SYSTEM DESIGN II

Credits: 1-4-3

Description: Hardware manufacture, software development, system integration, testing, design iteration, and operation of a space system in a team environment. When preceded by EA469, this course provides a two-semester capstone engineering design sequence.

Offered:

Requisites: Prereq: 1/C standing in Astronautics Track or Department Chair Approval.

Electrical and Computer Engineering Department Courses (EC, EE)

Course: EC244

Title: ELECTRONICS/ELECTROMECHANICS

Credits: 3-2-4

Description: This course is intended only for students in the Computer Engineering major and introduces them to electronics and electromechanics. Topics covered include amplifiers, comparators, diodes, voltage regulation, bipolar junction transistors, metal oxide field effect transistors (MOSFETs), single- and three-phase power delivery, ideal transformers, DC motors, and AC generators. Problem solving, laboratory exercises, and circuit design are emphasized.

Offered: Spring

Requisites: Prereq: EE221.

Course: EC262

Title: DIGITAL SYSTEMS

Credits: 3-2-4

Description: This course covers the fundamentals in realizing a digital system. Topics covered include Boolean algebra, Karnaugh mapping, flip-flops, state diagrams for system minimization and analysis of sequential and logic function circuits, binary arithmetic, decoders, encoders, multiplexers, and demultiplexers, as well as counter and register design. An introduction to complex programmable logic device (field programmable gate array) systems and VHDL is provided with applications to projects.

Offered: Fall 2022-2023

Requisites: Prereq: None.

Course: EC310

Title: APPLICATIONS OF CYBER ENGINEERING

Credits: 2-2-3

Description: This course focuses on the engineering aspects of cyber operations, including cyber reconnaissance, cyber defense, and cyber attacks, as a follow-on to SY110. There are two main areas of study, the host section (a single computer terminal), and the network section, including wireless communications. Each area of study culminates in a detailed description of a common type of cyber attack and the defenses against it. Lecture material is reinforced and supplemented with labs that demonstrate the theoretical concepts in an isolated, virtual environment.

Offered: Summer 2022-2023, Fall 2022-2023

Requisites: Prerequisite: Cyber 1 (SY110) Corequisites: Physics II (SP212 or SP222), or Dept Chair permission.

Course: EC312

Title: APPLICATIONS OF CYBER ENGINEERING FOR ERC

Credits: 2-2-3

Description: This course focuses on the engineering aspects of cyber operations, cyber defense, and cyber attacks. There are three main areas of study, including the host section (which includes an introduction to digital electronics), wireless communications, and computer networking-focusing on both the TCP/OP protocol and the Controller Area Network (CAN) protocol. Each area of study culminates in a detailed description of a common type of cyber attack and the defenses against it. Lecture material is reinforced and supplemented with labs/security exercises that demonstrate the theoretical concepts in an isolated, virtual environment.

Offered:

Requisites: Prereq: SY110, EW200/202, EE331.

Course: EC356

Title: COMPUTER NETWORKS WITH SECURITY APPLICATIONS

Credits: 3-2-4

Description: This course provides a foundation in the fundamentals of data and computer communications. Emphasis is placed on protocol and network design within the framework of the TCP/IP network architecture. Critical technical areas in data communications, wide-area networking, and local area networking are explored. Cyber security considerations, vulnerabilities, and solutions are examined at all levels of the network stack.

Offered:

Requisites: Prerequisite: EE353

Course: EC361

Title: MICROCOMPUTER-BASED DESIGN

Credits: 3-2-4

Description: A principles-based foundation to the analysis and design of systems using microprocessors. The student will acquire a detailed understanding of the architecture and instruction set of a representative microcontroller, assembly and C programming languages, and the use of interrupts. The student will design and build circuits with both digital and analog components and will learn to use timers, asynchronous serial communications, parallel communications, analog-to-digital and digital-to-analog converters, and pulse-width modulators. The derivation and use of design equations to achieve desired behavior is emphasized.

Offered: Fall 2022-2023

Requisites: Prereq: EC262 or EE313.

Course: EC362

Title: COMPUTER ARCHITECTURE

Credits: 3-2-4

Description: This course covers organization, structure, and design of computers, starting with a review of the history of computers. Design topics include: complex and reduced instruction set design; data addressing; design of central processing units, registers, and arithmetic logic units that covers two's complement addition and subtraction, and multiplication; circuits to handle exceptions; data busses; memory system design; input/output system design; fixed-point and floating-point hardware, pipelining design. VHDL implementation of a processor, and performance analysis.

Offered:

Requisites: Prereq: EC262 and EC361, or approval of department chair.

Course: EC404

Title: OPERATING SYSTEMS

Credits: 3-0-3

Description: This is an introductory course covering fundamental concepts and principles of computer operating systems with emphasis on process management including threads, memory management, file system structures, I/O management, and security. Students will engage in a number of programming projects

Offered:

Requisites: Prereq: SI204

Course: EC415

Title: COMPUTER ENG DESIGN II

Credits: 2-2-3

Description: This course provides practice in computer engineering design, development, and prototype testing. Following approval of the project by the instructor, the student develops a prototype, troubleshoots, and gathers performance data, then completes construction and packaging of the final design. A formal briefing to peers and department faculty follows a written final project report on the completed project in lieu of a final exam.

Offered: Spring

Requisites: Prereq: EE411 and 1/C ECE major, or approval of department chair.

Course: EC444

Title: HARDWARE SECURITY

Credits: 2-2-3

Description: This course seeks to teach students the basic fundamentals of hardware security to include both offensive and defensive measures at the hardware level. Students will gain an understanding of active and passive attacks and learn techniques to build secure systems starting from hardware. Students will be exposed to the concepts of reverse engineering, counterfeiting, and hardware Trojans.

Offered: Fall 2022-2023

Requisites: Prereq: EC262, SY304, or IC220.

Course: EC456

Title: WIRELESS NETWORKS

Credits: 2-2-3

Description: An introductory course in wireless networking and wireless network security. Major topics will include the wireless channel; the IEEE 802.11 (WiFi) standard, and wireless security. Additional topics (time permitting) may include Bluetooth, wireless sensor networks, and other advanced topics.

Offered:

Requisites: Prereq: EC356 or IC322.

Course: EC462

Title: ADVANCED COMPUTER ARCHITECTURE

Credits: 3-0-3

Description: This course provides students an in-depth look at the design of modern computers beginning with a review of elementary computer architecture and quickly moving into an examination of modern methods of high-speed performance from microprocessors. The course covers topics essential to modern superscalar processor design: review of pipelined processor design and advanced hierarchical memory design; additional topics including advanced branch prediction, register renaming, out-of-order execution and advanced speculation. This course also provides a coverage of memory and storage technologies, and also gets into parallel processing, vector machines, GPUs, CUDA programming, thread-level parallelism, and even warehouse/cloud computing. The last few weeks are dedicated to performing an analysis of research papers in the advanced computer architecture community.

Offered:

Requisites: Prereq: (EC362 & SI204) or (IC220 & IC210)

Course: EC463

Title: MICROCOMPUTER INTERFACING

Credits: 2-4-4

Description: This course provides a strong foundation in techniques for connecting computers to peripheral and communications devices and in the methodology for programming the computer to control external devices in real time. This course is supported by a project-oriented laboratory with an opportunity to use a wide variety of computer-controlled peripheral devices. A major emphasis of the course is the in-depth study of interrupt processing, polling, direct memory access, memory-mapped interface, parallel input/output (I/O) protocols, serial input/output (I/O) protocols, inter-process communication, and modular techniques for designing hardware and software.

Offered:

Requisites: Prereq: EC262 or EE313.

Course: EE221

Title: INTRODUCTION TO ELECTRICAL ENGINEERING I

Credits: 3-2-4

Description: This course addresses the analysis of linear electric circuits through the application of basic network laws and theorems. The student derives solutions for DC circuits, sinusoidal steady-state circuits, and first- and second-order circuits. Students are introduced to linear integrated circuits such as operational amplifiers and timers. Laboratory exercises where students build and design circuits and use test equipment reinforce course material. Introductory troubleshooting skills and lab notebook maintenance are emphasized. Computer simulation is used throughout the course to support both analysis and design objectives.

Offered: Fall 2022-2023

Requisites: Prereq: Calculus I. For EEE or ECE majors only, or permission of Dept Chair.

Course: EE241

Title: ELECTRONICS

Credits: 3-2-4

Description: The physics of semiconductor devices (p-n junction diode, bipolar and field effect transistors) is introduced. Device characterization in terms of appropriate external variables then leads to construction of small-signal and large-signal models. Emphasis is on practical electronic circuits such as amplifiers, filters, rectifiers, regulators and switching circuits.

Offered: Spring

Requisites: Prereq: EE221 or EE331.

Course: EE301

Title: ELECTRICAL FUND AND APPL

Credits: 3-2-4

Description: Provides an introduction to AC and DC circuit theory appropriate to model shipboard systems. Circuits of resistors, capacitors, inductors and sources are analyzed to predict steady state and first-order transient voltage, current, and power. Impedance matching, filters, transformers, motors/generators, and three-phase power distribution systems are introduced in the context of shipboard application. Laboratory exercises use tools and equipment found in the fleet and allow for a comparison of theoretical and actual circuit performance.

Offered: Summer 2022-2023, Fall 2022-2023

Requisites: Prereq: Physics II (SP212 or SP222).

Course: EE313

Title: LOGIC DESIGN AND MICROPROCESSORS

Credits: 3-2-4

Description: This is an introductory level project course in digital electronics for non-electrical engineering majors. It begins with the design, analysis and minimization of both combinatorial and sequential circuits and their realization in both discrete components and programmable logic devices. The course then progresses into the uses of MSI devices and digital arithmetic. Finally, an introduction to assembly level programming and microprocessor/microcontroller based systems design is also provided.

Offered: Spring

Requisites: Prereq: EC310 or EC312.

Course: EE320

Title: INTRO TO ELECTRICAL ENGR II

Credits: 2-2-3

Description: This course provides an introduction to the analysis of power systems and rotating machinery. The student applies circuit analysis techniques to solve single-phase and three-phase power problems. Further, the analysis of ideal and non-ideal transformers, DC machines, and synchronous machines is included. An introduction to power electronic circuits is provided, including DC motor speed control and power supply examples. Problem solving and laboratory exercises are emphasized.

Offered: Fall 2022-2023

Requisites: Prereq: EE221.

Course: EE322

Title: SIGNALS AND SYSTEMS

Credits: 3-2-4

Description: This course develops the relationship between the time and frequency domains for signals and the systems that operate upon them. Continuous- and discrete-time linear, time-invariant systems, including electrical circuits with zero initial conditions, are analyzed using the techniques of convolution as well as Fourier and Laplace transforms in order to determine their input-output relationships. Signals and systems are explored using these theoretical tools as well as in software simulations and hardware-based experiments.

Offered: Fall 2022-2023

Requisites: Prereq: EE241 or EC244 or approval of department chair.

Course: EE331

Title: ELECTRICAL ENGINEERING I

Credits: 3-2-4

Description: A study of DC and AC electrical elements and circuits, including Thevenin equivalence, natural and forced responses of first-order systems, AC power, and AC three-phase systems. Diodes, transformers and rectifier circuits are introduced and drive discussion of applications in power regulation and machine control. AC and DC machines are investigated and discussed the in the context of a shipboard environment.

Offered: Fall 2022-2023

Requisites: Prereq: Physics II (SP212 or SP222).

Course: EE342

Title: ADVANCED ELECTRONICS

Credits: 3-2-4

Description: A project-based course where students will explore advanced topics in analog circuits and design methodologies, with focus on operational amplifiers, oscillators, active filters, audio circuits, transistors, and integrated circuits. Students examine a wide range of sensors and actuators.

Offered:

Requisites: Prereq: EE241 or EC244.

Course: EE344

Title: POWER CONVERSION

Credits: 3-2-4

Description: This course covers the analysis, simulation, design, control, and construction of systems that convert electric power to the electrical and mechanical domains. Topics include power electronic circuits, motors, system design, and feedback control. Applications in renewable energy, manufacturing, robotics, and defense. The course provides a broad overview from low-level design to the selection of commercial products, and is especially useful for students in their capstone or research projects that include power conversion. Design through mathematical modeling and simulation, followed by implementation and testing, is emphasized.

Offered: Fall 2022-2023

Requisites: Prereq: EE320 or EE331 or permission of instructor.

Course: EE353

Title: PROB STATS & LIN ALG FOR ECE

Credits: 3-0-3

Description: This course is an introduction to probability, statistics, and linear algebra with applications to electrical and computer engineering. The course begins with the fundamentals of probability theory, and then relates these concepts to data analysis using the fundamentals of statistics. The course finishes with applications of linear algebra to solving engineering problems via matrix analysis and manipulation.

Offered: Fall 2022-2023

Requisites: Prereq: SM212 or SM222

Course: EE354

Title: MODERN COMM SYSTEMS WITH CYBER APPLICATIONS

Credits: 3-2-4

Description: An introduction to communication systems that focuses on the analysis and design of analog and digital communication systems in a cyber context. Topics include power and energy spectral density, quantization of analog signals, line coding, basic analog and digital modulation techniques, and transmitter and receiver design concepts. Modulation will be analyzed both on the basis of spectral characteristics and performance in AWGN channels. Application of these techniques to practical communication systems will be presented. The course ends with a brief introduction to spread spectrum and wireless communications.

Offered:

Requisites: Prereq: EE353 & EE322.

Course: EE372

Title: ENGINEERING ELECTROMAGNETICS

Credits: 3-2-4

Description: Basic transmission line theory is introduced with high-frequency circuit design applications. Maxwell's equations are formulated for time-varying fields and applied to propagation in free space, transmission lines and antennas. Labs provide practical experience with transmission lines, free space propagation, optical waveguides and antennas.

Offered:

Requisites: Prereq: Physics II (SP212 or SP222).

Course: EE411

Title: ELECT & COMP ENG DESIGN I

Credits: 2-2-3

Description: A series of design problems are presented to take the student through the total design process from specification to verification of performance. In addition to technical design, factors such as safety, economics, and ethical and societal implications are considered. A small project is executed and evaluated. Each student chooses a capstone project and develops and submits a proposed design to be completed in EE414 (for electrical engineers) or EE415 (for computer engineers). The proposal is presented to the student's peers and project advisors in lieu of a final exam.

Offered: Fall

Requisites: Prereq: 1/C standing in EEE major or ECE major or approval of department chair.

Course: EE414

Title: ELECTRICAL ENG DESIGN II

Credits: 2-2-3

Description: This course provides practice in engineering design, development, and prototype testing. Following approval of the project by the instructor, the student develops a prototype, troubleshoots, and gathers performance data, then completes construction and packaging of the final design. A formal briefing to peers and department faculty follows a written final project report on the completed project in lieu of a final exam

Offered: Spring

Requisites: Prereq: EE411 and 1/C EEE major, or approval of department chair.

Course: EE420

Title: ELECTRIC MACHINES AND DRIVES

Credits: 3-2-4

Description: The course includes an introduction to magnetic circuits and electromechanical energy conversion principles. Building on these topics, the basic operation, analysis, modeling and design of transformers, dc machines, induction machines, and synchronous machines is then presented. The simulation and power electronic control of dc and ac machines are considered. The output waveforms of a synchronous machine/three-phase rectifier, as part of a dc distribution system, are investigated. The course utilizes both simulation exercises and extensive laboratory hardware exercises to reinforce theory and validate derived models.

Offered: Fall

Requisites: Prereq: EE320.

Course: EE432

Title: DIGITAL SIGNAL PROCESSING

Credits: 3-2-4

Description: A follow-on to EE322 (Signals and Systems), this course further explores the creation (A/D) and processing of discrete-time signals and systems, which are analyzed both in the time and in frequency domains. The Discrete Time Fourier Transform and Z-Transform are introduced. Systems properties such as stability, linearity and time-invariance are studied. Focusing on linear time-invariant (LTI) systems, linear constant coefficient difference equations (LCCDEs) are used to relate the time-domain input-output relationship of a system to the system's frequency response. Digital filters, both FIR and IIR, are designed to meet specifications and applied to discrete inputs such as voice, music, and biomedical signals.

Offered: Fall 2022-2023

Requisites: Prereq: EE322 or approval of department chair.

Course: EE433

Title: WIRELESS COMMUNICATIONS

Credits: 3-2-4

Description: An in-depth study of cellular-based wireless communication systems. Topics include system design, mobile radio propagation, link budgets, small-scale fading, multipath, and diversity techniques for mobile radio. A working knowledge of the characteristics of licensed and unlicensed wireless systems in use in the U.S. today is also developed. Technical discussions of recent topics/publications related to the course material are included. Laboratory experiments emphasize indoor and outdoor RF propagation measurements. Students are expected to complete an extensive final project.

Offered:

Requisites: Prereq: EE354 or approval of department chair.

Course: EE434

Title: WIRELESS AND CELLULAR COMMUNICATIONS SYSTEMS II

Credits: 3-2-4

Description: A continuation of the in-depth study of wireless and cellular systems. This study includes modulation techniques for mobile radio, equalization, diversity, and channel coding. Small group research projects are conducted in lieu of a final examination.

Offered: Spring

Requisites: Prereq: EE433 or approval of department chair.

Course: EE435

Title: BIOMETRIC SIGNAL PROCESSING

Credits: 2-2-3

Description: This course is an introduction to the means and methods to automatically identify people based on their unique physical or physiological traits, called biometrics. It provides an overview of pattern recognition and image processing techniques, then covers how to apply those methods to the identification of irises, faces, fingerprints, and hand geometry.

Offered:

Requisites: Prereq: EE353 and EE322, or Department Chair approval.

Course: EE440

Title: BRAIN-MACHINE LEARNING

Credits: 2-2-3

Description: This course develops the concepts from machine learning, signal processing, and neuroscience required to understand how modern brain-machine interfaces - technologies that interact with the nervous system for therapeutic or rehabilitative purposes - interpret and respond to brain signals. Examples of these technologies include retinal prostheses for the blind and brain-driven limb prostheses for amputees. The course also examines brain-machine interfaces at the system level through directed readings of the scientific and engineering literature. Specific course topics include basic neuroanatomy and neurophysiology for engineers and statistical techniques for the dimensionality reduction, de-noising, classification, and clustering of neural signals.

Offered:

Requisites: Prereq: EE322 and EE353, or permission of instructor.

Course: EE451

Title: ELECTRONIC PROPERTIES OF SEMICONDUCTORS

Credits: 3-0-3

Description: This course develops an understanding of semiconductor properties and how they determine the performance of semiconductor devices. Hole and electron conduction and charge carrier distribution models are developed. Charge carrier generation and recombination and carrier dynamics leading to drift and diffusion are used to study semiconductor transport phenomena. The p-n junction, bipolar junction transistor, and field-effect transistor are studied in detail.

Offered: Fall 2022-2023

Requisites: Prereq: Physics II (SP212 or SP222) or EE241 or approval of department chair.

Course: EE472

Title: FIBER OPTICAL COMMUNICATIONS

Credits: 3-2-4

Description: An introduction to the nature of optical waveguides and fiber optical communications systems. Fiber propagation modes, dispersion and attenuation are studied. Lightwave transmitters and receivers, optical amplifiers, and components for wavelength division multiplexing are discussed, and a complete optical communication network is analyzed.

Offered: Spring

Requisites: Prereq: Physics II (SP212 or SP222) or permission of instructor.

Course: EE473

Title: PRINCIPLES OF RADAR & ELECTRONIC WARFARE

Credits: 3-0-3

Description: The course offers radar fundamentals, intermediate radar topics, special radar topics, and an overview of electronic warfare (EW). Fundamentals include the basics of range and Doppler estimation using pulsed and CW signals, radar detection theory, radar components, range and Doppler estimation, PRF and radar ambiguities. Intermediate topics include propagation issues, clutter processing, MTI and pulse Doppler, and tracking. Special topics include synthetic aperture radar (SAR) imaging, over-the-horizon (OTH) radar, and bistatic radar. The EW part of the course looks at each of the three EW principles: EA, EP, and ES - in turn, examining technologies and techniques.

Offered:

Requisites: Prereq: EE372 and EE354.

Course: EE475

Title: LASER FUNDAMENTALS

Credits: 3-0-3

Description: Basics of laser development and operation will be discussed, to include the wave and particle nature of light, coherence and polarization, elementary quantum mechanics, conditions for producing a laser, laser beam propagation and beam development through a vacuum as well as discussions of the effects of atmospheric turbulence. Additional topics could include ocean optics, Fourier optics, free-space optical (FSO) communications, holography, specific laser systems, atmospheric characterization, and non-linear optical effects.

Offered:

Requisites: Prereq: SP212 or permission of instructor.

Mechanical Engineering Department Courses (EG, EM, ER, EX)

Course: EG471

Title: ENGINEERING DESIGN I

Credits: 3-0-3

Description: The first course in a two-semester capstone design sequence for General Engineering majors. Topics include the engineering design process, project management, codes and standards. Students form design teams, select a capstone design project and progress through the project definition, proposal, exploratory research, concept selection and preliminary design stages of the project. The capstone design project continues in EM422.

Offered:

Requisites: 1/C General Engineering Major

Course: EG472

Title: ENGINEERING DESIGN II

Credits: 2-2-3

Description: Part two of the two-semester capstone design course sequence for General Engineering majors. Students continue with concept selection, detailed design, prototyping and evaluation of their capstone design projects. Formal presentations and reports are prepared to review and document the designs.

Offered:

Requisites: 1/C General Engineering Major; EM421

Course: EM211

Title: STATICS

Credits: 3-0-3

Description: An initial course in applied vector mechanics with emphasis on static equilibrium. Topics include forces, moments, couples, equivalent force-couple systems, centroids, distributed forces, and Coulomb friction. The application of the free body diagram in the analysis of static equilibrium of frames, machines and trusses is stressed.

Offered: Fall 2022-2023

Requisites: Prereq: None; Coreq: Calculus III and Physics I.

Course: EM215

Title: INTRODUCTION TO MECHANICAL ENGINEERING

Credits: 1-4-3

Description: This is an overview course for Mechanical, General, and Nuclear Engineering majors that introduces the student to the main areas of mechanics, materials, and thermoscience. In addition, it provides background in visualization skills and the design process. Projects are used to enhance the understanding of mechanical engineering and the design process.

Offered: Fall 2022-2023

Requisites: Prereq: None; for EME, EGE, and ENR majors only.

Course: EM217

Title: STRENGTH OF MATERIALS

Credits: 3-2-4

Description: A first course in mechanics of deformable bodies with emphasis on the engineering approach to the responses of these bodies to various types of loadings. Topics include stress-strain relationships, stress-strain analysis, stress and strain transformation (Mohr's circle), load-deflection, bending, torsion, buckling, and temperature effects.

Offered: Fall 2022-2023

Requisites: Prereq: EM211; Coreq: SM212.

Course: EM221

Title: MECHANICS FOR NUCLEAR ENGINEERING

Credits: 3-2-4

Description: Vector representation of force, resultant force and moment, equilibrium of concurrent and non-concurrent forces. Determinate and indeterminate force systems. Area moments and products of inertia. Support reactions and free-body diagrams for simple models of structures. Internal forces and moments in slender members. Cauchy's stress, linear strain, and Hooke's law for isotropic solids. Axial, torsional, and bending stresses in structural members. Axial and hoop stresses in thin- and thick-walled pressure vessels. Failure criteria for isotropic materials. Laboratory work integrated to enhance conceptual understanding and provide practical insight.

Offered: Fall 2022-2023

Requisites: Corequisites: SP211 and SM221

Course: EM232

Title: DYNAMICS

Credits: 3-0-3

Description: Course in classical vector dynamics. Topics include vector algebra and calculus, kinematics and kinetics of particles and rigid bodies, as well as energy and momentum methods. Extensive problem solving involving particle and rigid body motion is required.

Offered: Summer 2022-2023

Requisites: Prereq: EM211 Coreq: SM212.

Course: EM300

Title: PRINCIPLES OF PROPULSION

Credits: 3-2-4

Description: A study of the principles of energy conversion, fluid flow and hydraulics applied to naval engineering systems, including the basic operation of steam, gas turbine and internal combustion power plants, as well as heat exchangers, air conditioning, and refrigeration.

Offered: Summer 2022-2023, Fall 2022-2023

Requisites: Prereq: Physics I (SP211 or SP221).

Course: EM313

Title: MATERIALS SCIENCE

Credits: 3-2-4

Description: An introductory course in the physical and mechanical properties of engineering design materials including metals, ceramics and plastics, their structures, use in engineering applications and failure phenomena. All laboratory projects are structured to provide strong physical illustrations for the topics covered in lectures.

Offered: Fall 2022-2023

Requisites: Prereq: None.

Course: EM316

Title: THERMO-FLUID SCIENCES I

Credits: 3-0-3

Description: A first course in thermal systems that covers incompressible fluid mechanics and heat transfer. Topics in fluid mechanics include properties of fluids, fluid statics, integral conservation equations, differential field analysis, dimensional analysis and similitude, incompressible boundary layers, viscous flow in conduits and flow about immersed bodies. Topics in heat transfer include one-dimensional steady conduction, convection and radiation exchange. Heat transfer emphasis is related to heat exchangers and electronics cooling applications.

Offered: Fall 2022-2023

Requisites: Prereq: SC112; Coreq: SM212

Course: EM317

Title: THERMO-FLUID SCIENCES II

Credits: 2-2-3

Description: A basic thermodynamics course in which the first and second laws of thermodynamics are studied primarily from the classical macroscopic viewpoint and applied to both closed and open systems. Working substances include perfect gases,

real gases and vapors in addition to solids and liquids. Thermodynamic cycles are covered with specific reference to internal combustion engines, gas turbine engines, steam power plants and refrigeration. Methods for improving the performance of thermodynamic cycles are discussed including regeneration.

Offered: Fall 2022-2023

Requisites: Prereq: EM316 or EM324.

Course: EM319

Title: ENGINEERING THERMODYNAMICS

Credits: 3-0-3

Description: A basic thermodynamics course in which the first and second laws of thermodynamics are studied primarily from the classical macroscopic viewpoint and applied to both closed and open systems. Working substances include perfect gases, real gases and vapors in addition to solids and liquids. Naval applications are emphasized.

Offered: Fall 2022-2023

Requisites: Prereq: SC111; Coreq: SP211.

Course: EM320

Title: APPLIED THERMODYNAMICS

Credits: 2-2-3

Description: Laboratory equipment which operates on principles of thermodynamics and fluid mechanics is used to reinforce analyses and design of gas and vapor power cycles, refrigeration and air conditioning, ship and aircraft propulsion systems, combustion, energy conversion and compressible flow.

Offered: Spring

Requisites: Prereq: EM319 or equivalent.

Course: EM324

Title: FLUID DYNAMICS

Credits: 3-2-4

Description: An introductory course in fluid dynamics stressing both the integral and differential forms of the conservation laws of fluid flow. Engineering applications are made to hydrostatics and to ideal and real fluid flows. Laboratory experiments and problems sessions complement the lectures.

Offered: Fall 2022-2023

Requisites: Prereq: SM212 and 2C standing or with approval of the Department Chair.

Course: EM371

Title: INTRODUCTION TO DESIGN

Credits: 2-2-3

Description: Fundamentals of mechanical design, with emphasis on the design of pertinent machine elements. Topics such as fasteners, springs, anti-friction bearings, lubrication and journal bearings, gearing and shafts are covered. Also included are static and fatigue failure theories.

Offered: Fall 2022-2023

Requisites: Prereq: EM217 and EM232.

Course: EM375

Title: MECHANICAL ENGINEERING EXPERIMENTATION

Credits: 2-2-3

Description: A design course that emphasizes the theory and practical considerations associated with contemporary experimental procedures, methods and design strategies. Topics include measurement error and its propagation, equation fitting and plotting, signal acquisition and validation, instrument response and elements of experimental design. Emphasis includes computer aided data reduction, modeling of a system and report writing.

Offered: Spring

Requisites: Prereq: SM212, EM217, and EM232.

Course: EM380

Title: ENGINEERING REVIEW

Credits: 0-2-0

Description: A comprehensive review course to prepare students to take the Engineer-In-Training (EIT) or Fundamentals of Engineering (FE) examination. Topics include mathematics, chemistry, computers, electrical engineering, engineering economics, statics, dynamics, thermodynamics, fluid mechanics, and mechanics of materials.

Offered: Spring

Requisites: Prereq: 1/C engineering major.

Course: EM415

Title: HEAT TRANSFER

Credits: 3-2-4

Description: Study of thermal radiation, steady and transient conduction, laminar and turbulent convection, internal and external flow, boundary layers and empirical correlations. Applications address fins, nuclear reactor cooling, heat exchangers and interactive computing.

Offered: Fall 2022-2023

Requisites: Prereq: EM319 and EM324.

Course: EM420

Title: PROJECT MANAGEMENT MECH ENG

Credits: 3-0-3

Description: Project Management for Mechanical Engineers is an introduction to the fundamentals of project management. Topics include planning projects, schedules, budgets, resources, data analysis, project team dynamics, implementation, execution, performance measurement and closeout.

Offered: Fall, Spring

Requisites: Prereq: Engineering major or approval of department chair.

Course: EM423

Title: MECHANICAL VIBRATIONS

Credits: 2-2-3

Description: The treatment of vibration fundamentals including free, damped and forced harmonic vibrations of linear single and multi-degree of freedom systems, modal analysis, continuous systems and a practical project.

Offered: Spring

Requisites: Prereq: EM217 and EM232.

Course: EM424

Title: ANALYTICAL METHODS MECHANICS

Credits: 3-0-3

Description: Review of solution methods to frequently encountered engineering problems such as cylindrical and spherical heat conduction, wave dynamics, boundary layers and vibrations. The solutions methods focus on problems encountered in solid mechanics, fluids mechanics and heat transfer. Includes both analytical and numerical problem solving techniques.

Offered: Fall 2022-2023

Requisites: Prereq: SM212.

Course: EM433

Title: COMPUTER-AIDED MANUFACTURING

Credits: 2-2-3

Description: This course examines how computers and automation are used in modern manufacturing processes. Topics include machining processes, CNC programming, process planning, dimensioning, and tolerancing. Students participate in a manufacturing project which utilizes CAD/CAM software to design and manufacture a component using CNC machining equipment.

Offered: Fall 2022-2023

Requisites: Prereq: 1/C engineering major.

Course: EM434

Title: ADDITIVE MANUFACTURING

Credits: 3-0-3

Description: A course in current Additive Manufacturing (AM) technologies and their applications in the Department of Defense and industry. Practical hands-on use of AM, engineering design for AM, and modern topics in AM are core areas emphasized in a project-based learning environment with potential for tangible contributions to the operating forces of the Navy and Marine Corps. All AM methods are reviewed with emphasis on Fused Deposition Modeling (FDM), Stereolithography, and Selective Laser Sintering (SLS). Cannot receive credit for both EM434 and EW470.

Offered: Fall 2022-2023

Requisites: Prereq: EM217, EM221, EA222, EN222, or approval of the Dept Chair.

Course: EM436

Title: MECHANICS OF COMPOSITE STRUCTURES

Credits: 2-2-3

Description: Mechanics of Composite Structures is an introductory course that emphasizes the mechanics of structures containing composite materials. Mechanics topics covered include generalized Hooke's Law, lamina constitutive relationships, lamina strength analysis, micro-mechanics of fiber reinforced lamina, and the mechanics of composite laminates. In addition materials science and manufacturing of composites are covered. A project that requires both the design, manufacture and testing of a composite component or structure concludes this course.

Offered:

Requisites: Prereq: EM217.

Course: EM441

Title: DIRECTED ENERGY WEAPONS

Credits: 3-0-3

Description: This course will provide students with an introduction to the use of Directed Energy Systems. Topics covered include propagation of directed energy, atmospheric effects and modeling, and simulation of a directed energy beam. In addition, an overview of the technology and analysis needed to understand and design the beam control systems that accomplish acquisition, tracking, and pointing of shipboard lasers will be discussed.

Offered:

Requisites: Prereq: SM212 and SP212

Course: EM443

Title: ENERGY CONVERSION

Credits: 3-0-3

Description: Fundamentals of applied energy systems including types and sources of energy; forms and methods of energy delivery; and the sectors, magnitude, and use patterns of energy consumption. Focusing on the US national energy situation, topics include energy conversion processes in existing and projected power, transportation, heating and cooling systems, with emphasis on efficiency, economic viability, and environmental impacts. Traditional and nontraditional fuels; nuclear energy systems, alternate energy systems, and methods of energy storage.

Offered: Spring

Requisites: Prereq: EM319 or equivalent.

Course: EM444

Title: SOLAR ENGINEERING

Credits: 3-0-3

Description: An introduction to solar energy conversion and utilization. Topics covered include solar radiation, collectors, energy storage, solar heating, solar cooling, photovoltaic converters and wind energy.

Offered: Fall, Spring

Requisites: Prereq: 1/C engineering major or approval of department chair.

Course: EM445

Title: NONDESTRUCTIVE EVALUATION

Credits: 2-2-3

Description: The course examines each of the quantitative sensor-based methods for non-invasively assessing the structural integrity of materials -- metals and composites. The methods covered include sonic, ultrasonic, electro-magnetic, optical and infrared. The important properties of any sensor are its wavelength, beam spread, and resolution and each student will receive a solid understanding of how these three key parameters are used to provide optimal NDE results for understanding material properties as well as detecting internal defects. Labs involve materials imaging, subsurface characterization and imaging, microstructure and properties characterization, and defect characterization in naval and aerospace components.

Offered: Spring

Requisites: Prereq: SP212, EM313.

Course: EM447

Title: WIND AND TIDAL ENERGY

Credits: 3-0-3

Description: This course will cover wind and water turbine technology including design of turbine blades, analysis of flow regimes and energy conversion. The economics and policies involved in implementing these renewable energy systems will also be studied.

Offered:

Requisites: Prereq: EM317 or EM319 and EM316, EM324 or EA301.

Course: EM451

Title: DESIGN OF ROBOTIC ELEMENTS

Credits: 2-2-3

Description: This course addresses practical issues concerning the design, fabrication and operation of wheel-driven mobile robots. The objectives of the course are to: (a) Design and fabricate wheel-driven mobile robots to accomplish particular performance objectives, (2) Select typical elements used in robot construction such as electric motors, drive train components, pneumatic components, and sensors, and (3) Develop and test code for a programmable robot controller to incorporate various sensors and enable autonomous operation. The course utilizes a hands-on, project-based approach to learning about robotics.

Offered: Fall

Requisites: Prereq: EM371 or ER371 or permission of instructor.

Course: EM452

Title: MECHANICS OF MATERIALS

Credits: 3-0-3

Description: This is a fundamental course in mechanics of deformable bodies with an emphasis on the engineering approach to the elastic response of simple deformable bodies to various types of loadings. Topics include axial, torsion and bending loads, combined loads, stress-strain relationships, stress and strain transformation (Mohr's circle), load-deflection, buckling, and temperature effects. Midshipmen who take EM217 cannot also receive credit for EM452.

Offered:

Requisites: Prereq: EM211. Coreq: SM212.

Course: EM456

Title: CORROSION AND CORROSION CONTROL

Credits: 2-2-3

Description: A course dedicated to the study of various types of corrosion including the electrochemical and metallurgical mechanisms responsible for each and their prevention. The course concentrates principally on the structural alloys used in the marine environment. Laboratory sessions involve demonstrations and hands-on experiments which complement the lecture material.

Offered: Spring

Requisites: Prereq: EA222 or EM313 or ER313 or EN380 or EM452.

Course: EM461

Title: ENGINES: PRINCIPLES, DESIGN AND APPLICATIONS

Credits: 2-2-3

Description: The course objective is to provide a fundamental understanding of reciprocating internal-combustion engine design and operation. This is achieved by linking existing engine hardware design and performance analysis to concepts and disciplines studied in the mechanical engineering curriculum.

Offered:

Requisites: Prereq: EM320 and EM324 or approval of department chair.

Course: EM471

Title: MECHANICAL ENGINEERING DESIGN I

Credits: 2-2-3

Description: The first course in a two-semester capstone design sequence. Topics include the engineering design process, project management, codes and standards, engineering ethics, and computer-aided design. Students form design teams, select a capstone design project and progress through the proposal and preliminary design stages of the project. The capstone design project continues in EM472.

Offered: Fall

Requisites: Prereq: EM371, ER371, or Dept Chair Approval

Course: EM472

Title: MECHANICAL ENGINEERING DESIGN II

Credits: 2-2-3

Description: Part two of the two-semester capstone design course sequence. Students continue with concept selection, detail design, prototyping and evaluation of their capstone design projects. Formal presentations and reports are prepared to review and document the designs.

Offered: Spring

Requisites: Prereq: (EM371 or ER371, and EM471) or approval of department chair.

Course: EM473

Title: DESIGN OF MODERN WEAPONS

Credits: 3-0-3

Description: The course objectives are to teach students how explosives function, how they are manufactured, and how they are used. They will also learn the principles of warhead design and the determination of weapons system effectiveness. Students will form design teams and build representative weapons to be tested at a Navy Test Range. They will also study the Target Planning Cycle and the purpose of weapons testing.

Offered:

Requisites:

Course: EM474

Title: GAS TURBINES: DESIGN AND ANALYSIS

Credits: 2-2-3

Description: A course designed to acquaint the student with the design and analysis of modern gas turbine engines currently employed by the U.S. Navy. Gas turbine cycles are studied along with the various components that comprise gas turbine engines such as axial and centrifugal compressors, combustors, axial turbines, intercoolers, reheaters, regenerators and inlet/exit diffusers and nozzles. Future concepts in turbomachinery propulsion will be discussed. The course assumes a basic knowledge of thermodynamics and will add to the student's knowledge in such areas as compressible flow in turbomachinery, combustion analysis and emissions control. The culmination of the course is a final design project.

Offered: Spring

Requisites: Prereq: EM320 or permission of instructor.

Course: EM476

Title: VEHICLE DYNAMICS

Credits: 2-2-3

Description: The fundamentals of passenger vehicle and light truck design and vehicle dynamics are covered. The engineering principles associated with acceleration, braking, handling, ride quality, aerodynamics and tire characteristics are discussed, as well as suspension and steering design. There will also be several lab exercises where vehicle systems are evaluated by students.

Offered:

Requisites: Prereq: 1C Engineering major or approval of Dept Chair.

Course: ER301

Title: FUNDAMENTALS OF NUCLEAR ENGINEERING

Credits: 3-0-3

Description: An introductory course in the basics of nuclear engineering and radiological sciences. Subject areas include the basics in radiation physics, nuclear plant design, the fuel cycle and radiological health physics.

Offered: Fall 2022-2023

Requisites: Prereq: SP211 (or equivalent). Coreq: SP212 (or equivalent).

Course: ER313

Title: NUCLEAR MATERIAL SCIENCE

Credits: 3-2-4

Description: An introductory course in material science and engineering with an emphasis on the importance of material selection and design for the Nuclear Engineering major. It involves the study of the structure and properties of materials and how these are interrelated and influenced by manufacturing, processing, and the environment. The course concentrates predominantly on metallic materials with emphasis on materials used in nuclear applications. Radiation interactions with matter are also reviewed leading to a understanding of radiation damage to structural materials.

Offered: Fall 2022-2023

Requisites: Coreq: EM221/EM217

Course: ER327

Title: APPLIED NUCLEAR PHYSICS

Credits: 3-0-3

Description: Introduction to the basic concepts of nuclear physics for engineering students. Emphasis is placed on the structure and stability of the nucleus, nuclear forces, decay processes, nuclear reactions, and interactions of radiation with matter. Nuclear Engineering applications are highlighted.

Offered: Fall 2022-2023

Requisites: Prereq: ER301 Coreq: SM212

Course: ER362

Title: REACTOR PHYSICS

Credits: 2-2-3

Description: Reactor Physics provides the principles underlying power generation in both a steady state and transient fission reactor. Subject areas include neutron diffusion and slowing down theory, criticality, bare, reflected and heterogeneous reactors, reactor kinetics, and reactor control. Experiments and classroom exercises include the determination of important reactor parameters, the use of computational methods, and the use of plant simulation software.

Offered:

Requisites: Prereq: ER301.

Course: ER371

Title: NUCLEAR PLANT DESIGN

Credits: 3-0-3

Description: Fundamentals of nuclear power plant design, with emphasis on basis for light water reactor design. Topics include power reactor economics, design considerations dealing with the nuclear fuel cycle, primary and secondary system components and reactor safety. A term project involving the analysis of a modern nuclear reactor design will be completed.

Offered:

Requisites: Prereq: ER301.

Course: ER460

Title: INTRO TO HEALTH PHYSICS

Credits: 3-0-3

Description: Broad and quantitative overview of health physics, including radiation sources, measurement and dosimetry, exposure, interaction in the body, biological effects, imaging and medical applications, protection, accidents, and regulations.

Offered:

Requisites: Prereq: ER301

Course: ER461

Title: NUCLEAR WEAPONS EFFECTS

Credits: 3-0-3

Description: Introduction to nuclear weapons with historical references, yield calculations, physics of assembly, fission, fusion, and disassembly. Prompt and residual effects, modeling, biological effects, and nuclear policy are covered.

Offered:

Requisites: Prereq: SP212 and SM212

Course: ER463

Title: RADIATION ENGINEERING

Credits: 2-2-3

Description: An introductory course in basic radiation detection and measurement systems. Subject areas include radiation statistics, data analysis, gas-filled detectors, scintillation detectors, semi-conductor detectors, gamma and charged particle spectroscopy, signal processing and electronics, neutron detection techniques, activation analysis, neutron generators, and radiation detection applications.

Offered:

Requisites: Prereq: ER301.

Course: ER468

Title: NUCLEAR PLANT ENGINEERING

Credits: 3-0-3

Description: Fundamentals of the thermodynamics, fluid mechanics and heat transfer associated with the design, operation and safety of nuclear power plants are analyzed. Thermal hydraulic fundamentals are applied to the reactor core, primary and secondary systems. Effects of reactor transients are also analyzed.

Offered: Fall 2022-2023

Requisites: Prereq: ER371.

Course: EX401

Title: INTERDISCIPLINARY CAPSTONE DESIGN I

Credits: 2-2-3

Description: The first course in a two-semester interdisciplinary capstone design sequence. Projects and teams are selected during the previous semester. Student teams work through the design process including the problem definition, information gathering, concept generation, and design selection phases. Project management and design communication - both written and oral - are emphasized throughout. The design process continues in EX402.

Offered: Fall 2022-2023

Requisites: Prereq: EM371, ER371, or permission of the EME Chair. Permission of major's Dept Chair.

Course: EX402

Title: INTERDISCIPLINARY CAPSTONE DESIGN II

Credits: 2-2-3

Description: The second course in a two-semester interdisciplinary capstone design sequence. Continuing the work done in EX401, the goal of the course is a working prototype, be it a physical product, detailed analytical model, algorithm, or software application. The design process concludes with the product architecture, configuration design, parametric design, and detail design phases. Greater emphasis is placed on an incremental process of testing, evaluation, and redesign of prototypes.

Offered:

Requisites: Prereq: EX401.

Course: EX475

Title: INTERDISCIPLINARY CAPSTONE DESIGN I - FORMULA SAE

Credits: 2-2-3

Description: This course is the first in a two course sequence that provides the capstone experience for an interdisciplinary team of midshipmen designing, fabricating, and testing a small formula style racecar. During this semester, students will learn the formal design process from determining customer needs to developing a detailed design that meets all objectives. Students will become familiar with various vehicle subsystems and conduct extensive design, modeling, simulation and analysis using state of the art software tools. Work will be completed in a teaming environment focused on effective program management and students will complete a series of oral and written design reviews.

Offered:

Requisites: Prereq: EM371 or permission of the EME Dept Chair. Permission of Major Dept Chair.

Course: EX476

Title: INTERDISCIPLINARY CAPSTONE DESIGN II - FORMULA SAE

Credits: 1-4-3

Description: This course is the second in a two course sequence that provides the capstone experience for an interdisciplinary team of midshipmen designing, fabricating, and testing a small formula style racecar. During this semester, students will focus on fabrication and testing of the project vehicle using detailed designs developed during the previous semester. Work will be completed in a teaming environment focused on effective program management and students will complete a series of oral and written design reviews. The course culminates in participation in an intercollegiate competition.

Offered:

Requisites: Prereq: EX475.

Naval Architecture and Ocean Engineering Department Courses (EN, EO)

Course: EN221

Title: ENGR MECH W/MARINE APPS I

Credits: 3-2-4

Description: First course in two-semester sequence covering the principles of engineering mechanics of rigid and deformable bodies for naval architecture students. Topics in the first course include forces, moments, static equilibrium, stress, strain, stress-strain relations and transformations, torsions in shafts, flexure in beams, column buckling, and temperature effects.

Offered: Fall 2022-2023

Requisites: Prereq: 3/C ENM major.

Course: EN222

Title: ENGR MECH W/MARINE APPS II

Credits: 3-2-4

Description: The second course in a two semester sequence covering the principles of engineering mechanics of rigid and deformable bodies for naval architecture students. Topics in the second course include: generalized Hooke's Law and states of stress, structural failure theories, motion of a point, energy methods, impact loadings, momentum methods, planar kinematics of rigid bodies, energy and momentum in rigid body dynamics and single DOF vibration analysis.

Offered: Spring

Requisites: Prereq: EN221.

Course: EN245

Title: PRINCIPLES OF OCEAN SYSTEMS ENGINEERING

Credits: 2-2-3

Description: This course introduces new ocean engineering majors to the general problems and design practices in the areas of the ocean environment, coastal engineering, offshore structures, ocean materials, ocean acoustics, and underwater systems. Basic naval architecture principles are also covered, including hydrostatics, stability and buoyancy, and powering. The use of laboratory experiments and computer-aided drafting (CAD), are emphasized.

Offered: Fall 2022-2023

Requisites: Prereq: EOE major or approval of department chair.

Course: EN247

Title: PRINCIPLES OF NAVAL ARCH & MARINE ENGR

Credits: 2-2-3

Description: This course, which is intended for midshipmen majoring in naval architecture, provides an overview of topics paramount to ship design. Topics include introductions to engineering design, engineering graphics, numerical methods, buoyancy, ship structures, and marine propulsion systems. A design project is used to provide students with a hands-on experience in designing a simple vessel.

Offered: Fall 2022-2023

Requisites: Prereq: ENM major or approval of department chair.

Course: EN330

Title: PROBS & STATS W/ OCEAN APPLS

Credits: 3-0-3

Description: Covers the basic concepts of probability and statistics with the aim of providing an understanding of the probabilistic nature of the forces acting on a marine structure. A statistical representation of the sea surface is developed in order to determine design values for structural loading and vehicle motion.

Offered: Fall 2022-2023

Requisites: Prereq: SM212 and (EN245 or EN247).

Course: EN342

Title: SHIP HYDROSTATICS AND STABILITY

Credits: 3-2-4

Description: Theories and procedures for predicting a ship's hydrostatic response to various conditions are addressed. Methods for computing the stability characteristics of both intact and damaged ships are studied. Floodable length computations are taught. Stability and subdivision criteria are explained. The lines plan for a hull form is developed and analyzed.

Offered: Fall

Requisites: Prereq: EN245 or EN247.

Course: EN350

Title: MARINE ENGINEERING SYSTEMS

Credits: 2-2-3

Description: This course expands on how the major shipboard machinery systems impact the ship design process and the resulting ship. The basic characteristics of common machinery and electrical and piping distributive systems are introduced along with how specifications and drawings are developed for specific ship designs. Lectures are complemented by hands-on labs and field trips to various vessels.

Offered: Fall 2022-2023

Requisites: Coreq: EM316 or EM324.

Course: EN353

Title: RESISTANCE AND PROPULSION

Credits: 3-2-4

Description: Topics include dimensional analysis, similitude, wave and viscous resistance of ships, ship-model testing techniques, full-scale performance prediction, momentum theory of propulsive devices, and propeller vibrations and design. This course also covers the experimental aspects of marine vehicle resistance and propulsion.

Offered: Spring

Requisites: Prereq: (EN245 or EN247) and (EM318 or EM324).

Course: EN358

Title: SHIP STRUCTURES

Credits: 3-2-4

Description: A course in structural theory and practice. Topics include longitudinal and transverse strength of the hull girder, bending moments in a seaway, plate theory, development of ship structural design, Finite Element analysis, and applications of shipbuilding materials.

Offered: Spring

Requisites: Prereq: EM217 or EN222; Coreq: EN353.

Course: EN380

Title: NAVAL MATERIALS SCIENCE AND ENGINEERING

Credits: 3-0-3

Description: This course addresses the optimal use of materials in ocean systems with emphasis on corrosion prevention, fracture mechanics, and basic materials science.

Offered: Fall 2022-2023

Requisites: Prereq: Chemistry II (SC112 or SC151); Coreq: EM217 or EN222.

Course: EN400

Title: PRINCIPLES OF SHIP PERFORMANCE

Credits: 3-2-4

Description: This course is an introduction to the applied science of ship systems. The course describes ships and submarines and how they remain afloat from a design and application perspective. Included are topics in hydrostatics, ship stability and operability, materials, fluid dynamics and propulsion. EN400 is an appropriate substitute for all majors where EN200 is required.

Offered: Summer 2022-2023, Fall 2022-2023

Requisites: Prereq: 2/C standing or permission of department chair.

Course: EN401

Title: ENGINEERING IN THE LITTORAL ZONE

Credits: 3-2-4

Description: This course is an introduction to engineering principles applied to the near-shore and on-shore environment. Basic engineering mechanics, strength of materials and soil mechanics are studied to provide a base for further investigation. Coastal processes including wave action, sediment transport, beach formation and erosion are discussed. How the combination of such processes and basic mechanics affect such things as small boat hydrostatics, sea-to-shore logistics operations, and coastal structure assessment and construction are studied. 1/C midshipmen having selected (or intending to select) Marine Corps service may substitute EN401 for EN200.

Offered: Fall 2022-2023

Requisites: Prereq: 1/C standing or permission of department chair.

Course: EN411

Title: OCEAN ENVIRONMENTAL ENGINEERING I

Credits: 2-2-3

Description: An introduction to basic principles and current issues in environmental engineering as applied to the ocean environment. Topical coverage includes chemical and biological considerations in water quality, diffusion and dispersion in estuaries and oceanic environments, engineering methods used to analyze and mitigate the effects of marine pollution, and environmental ethics and regulatory statutes.

Offered: Fall 2022-2023

Requisites: Prereq: 1/C engineering major or approval of department chair.

Course: EN412

Title: OCEAN ENVIRONMENTAL ENGINEERING II

Credits: 3-0-3

Description: Basic principles and current issues in environmental engineering as applied to the ocean environment are introduced. Principal focus is on ocean resources: their identification, recovery, and utilization. Topical coverage includes the technological aspects of alternate energy sources; deep-ocean oil and gas recovery; desalinization; dredging and uses for dredge spoil; mineral exploitation; ocean depositories; wetlands, reefs and other coastal developments; and environmental economics, ethics, and regulatory statutes.

Offered: Spring

Requisites: Prereq: 1/C engineering major or approval of department chair.

Course: EN420

Title: COASTAL ENGINEERING

Credits: 2-2-3

Description: This course provides an overview of the methods used to design both shore protection systems and port and harbor structures. Topics include sea level fluctuations, wind-wave forecasting, shallow water wave transformation, sediment transport, littoral processes, "soft engineering" approaches like beach nourishment, and structural design of revetments, groins, jetties, and breakwaters. Emphasis is on the design process using Army Corps of Engineers design manuals.

Offered: Fall 2022-2023

Requisites: Prereq: EN475, 1/C EOE major or approval of department chair.

Course: EN426

Title: PORT AND HARBOR ENGINEERING

Credits: 3-0-3

Description: Covers engineering of marine terminals and small-craft harbors, ship berthing and maneuvering considerations, port navigation, port-related structures, channel design, floating terminals, offshore moorings, dredging, and port security.

Offered:

Requisites: Prereq: EN245 and EOE major or Dept Chair approval.

Course: EN428

Title: ENGINEERING FOR COLD REGIONS

Credits: 3-0-3

Description: This course presents and discusses the Arctic environment and engineering challenges in cold regions of the earth. The course emphasizes the inherent features of sea ice, the littoral zone in the Arctic, and ships in ice. Aspects of constructed facilities and operations unique to cold regions will be studied including: engineering materials; frozen soil conditions; building for cold/frozen conditions; human performance in the cold; ice engineering; and the effect of ice and snow on the built environment including coastal conditions. The course will also provide an overview of modern ice-class ship technology and the world-wide ice-class fleet.

Offered:

Requisites: Prereq: EM317

Course: EN430

Title: UNDERWATER WORK SYSTEMS

Credits: 2-2-3

Description: This course acquaints the student with design and operational considerations for working in the subsea environment. Topic coverage includes manned submersibles, unmanned remotely-operated vehicles, autonomous underwater vehicles, and deep-dive systems.

Offered: Fall 2022-2023

Requisites: Prereq: 1/C engineering major or approval of department chair.

Course: EN431

Title: MARINE ENGINEERING SYSTEMS

Credits: 2-2-3

Description: This course expands on how the major shipboard machinery systems impact the ship design process and the resulting ship. The basic characteristics of common machinery and electrical and piping distributive systems are introduced along with how specifications and drawings are developed for specific ship designs. Lectures are complemented by hands-on labs and field trips to various vessels.

Offered:

Requisites: Prereq: EN353 and (EM316 or EM324) or Dept Chair approval.

Course: EN434

Title: OCEAN EXPLORATION: SCIENCE & TECHNOLOGY

Credits: 3-0-3

Description: This class provides the student with an understanding of shipwrecks that may be considered historically significant; the methodologies for shipwreck search and discovery; the archaeological approach and reasoning necessary for preserving the material culture and context of the shipwreck site; and the basic methods for preservation, conservation and salvage and recovery if deemed appropriate. Topics covered include the role of history in ship evolution and technological developments; ship construction methods thru the various periods; library research; geophysical search tools; data presentation and visualization; cultural heritage management; and ocean engineering principles in support of shipwreck archaeology, recovery and management.

Offered:

Requisites: Prereq: 2C or 1C standing

Course: EN440

Title: DESIGN OF FOUNDATIONS FOR OCEAN STRUCTURES

Credits: 3-0-3

Description: This course covers basic soil mechanics principles and then applies these to the design of foundation systems, with an emphasis on the unique nature of coastal and ocean conditions. Topics include recommended practices and procedures for planning, designing and constructing adequate foundations for marine structures, including shallow foundations, deep pile foundation, vertical retaining walls, and anchoring systems.

Offered: Fall, Spring

Requisites: Prereq: (EM217 or EN222) and 1/C EOE major or approval of department chair.

Course: EN441

Title: OCEAN ENGINEERING STRUCTURES I

Credits: 3-0-3

Description: Structural design considerations for fixed ocean structures, such as docks, piers, and steel-jacket structures, are analyzed. Design techniques including matrix methods and finite element analysis are introduced. Boundary conditions, wave effects, foundations, loading and materials considerations are studied.

Offered: Fall, Spring

Requisites: Prereq: EM217 or EN222.

Course: EN442

Title: OCEAN ENG STRUCTURES II

Credits: 2-2-3

Description: In this course in structural design theory and practice, basic structural elements of offshore and coastal structures are designed using current engineering design codes. Topics include material properties, connection methods, and the design of steel, composite, and concrete structures.

Offered: Fall 2022-2023

Requisites: Prereq: EN441.

Course: EN445

Title: MARINE FABRICATION METHODS

Credits: 2-2-3

Description: This course presents some of the basic techniques used to fabricate offshore structures and ships. Lecture and lab topics develop an understanding of metal, concrete, and composite construction and quality control methods through the manufacturing and testing of small components representative of those used in the marine environment. An understanding of fabrication specifications is developed through group projects in each material category.

Offered: Fall 2022-2023

Requisites: Prereq: EN380.

Course: EN447

Title: AUTONOMOUS VESSEL DESIGN

Credits: 2-2-3

Description: In this course midshipmen will work as a team to learn and apply the fundamentals of small craft design by performing the design of a small autonomous sail and solar-powered surface vessel.

Offered: Fall

Requisites: Prereq: ENM major or approval of department chair.

Course: EN448

Title: AUTONOMOUS VESSEL FAB & EVAL

Credits: 1-4-3

Description: In this course midshipmen will work as a team to complete the final design, fabricate, evaluate, and develop a small autonomous sail and solar-powered surface vessel.

Offered: Spring

Requisites: Prereq: ENM major or approval of department chair.

Course: EN450

Title: ENGINEERING ECONOMIC ANALYSIS

Credits: 3-0-3

Description: Basic methods and reasons for conducting an engineering economic study are presented. Economic criteria are developed. Procedures for selecting from among a set of technically feasible alternatives are studied. Assumptions and implications associated with these decision-making procedures are discussed.

Offered: Fall, Spring

Requisites: Prereq: 1/C engineering major or approval of department chair.

Course: EN454

Title: PROJ MGMT FOR OCEAN ENGRS

Credits: 3-0-3

Description: The course goal: enhance midshipmen project management skills in engineering related situations using quantitative and qualitative methods. Topics covered include relevant decision theories, statistical analysis, inventory control, network concepts, pert diagrams, critical path methods, and risk management.

Offered: Spring

Requisites: Prereq: 1/C NAOE major or approval of department chair.

Course: EN455

Title: SEAKEEPING AND MANEUVERING

Credits: 2-2-3

Description: Topics include ship steering, maneuvering, motion and seakeeping. The basic equations of motion for a maneuvering ship and for ship motions in a seaway are developed, and various methods of solution are discussed. The course also covers the experimental aspects of seakeeping and maneuvering.

Offered: Fall 2022-2023

Requisites: Prereq: EN353.

Course: EN456

Title: ADVANCED METHODS IN SHIP DESIGN

Credits: 3-0-3

Description: An introduction to computer-aided ship design is presented. Topics include numerical procedures applied to form, stability, resistance, propulsion, motion, maneuvering and strength. .

Offered: Fall

Requisites: Prereq: EN353 or approval of department chair.

Course: EN457

Title: HYDROFOIL AND PROPELLER DESIGN

Credits: 3-0-3

Description: The analysis and design of hydrofoils and marine propellers are presented. Lifting line and lifting surface theories are applied to naval devices. Design and towing tank work supplements recitations.

Offered: Spring

Requisites: Prereq: EN353 or approval of department chair.

Course: EN458

Title: ADVANCED MARINE VEHICLES

Credits: 2-2-3

Description: Modern watercraft discussed include multihulls, planing boats, hydrofoil craft, and surface effect vehicles. Analysis and design features are investigated experimentally in the towing tank when appropriate.

Offered: Spring

Requisites: Prereq: EN353.

Course: EN458H

Title: ADVANCED MARINE VEHICLES (HONORS)

Credits: 3-2-4

Description: Modern watercraft discussed include planing boats, hydrofoil craft, and ground effect machines and combatant and research submersibles. Analysis and design features are investigated experimentally in the towing tank when appropriate.

Offered: Spring

Requisites: Prereq: EN353 and ENMH major or Dept Chair approval.

Course: EN461

Title: OCEAN SYSTEMS ENGINEERING DESIGN I

Credits: 2-2-3

Description: Engineering design is introduced as an interdisciplinary activity coupling such subjects as applied probability and statistics, cost assessment, decision-making, economic evaluation, engineering ethics, and project planning. Instruction in hydrographic surveying and profiling, computer-aided drafting, and design report preparation and presentation is included.

Offered: Fall 2022-2023

Requisites: Prereq: 1/C standing in ocean engineering major.

Course: EN462

Title: OCEAN SYSTEMS ENGINEERING DESIGN II

Credits: 2-2-3

Description: The conceptual design of an ocean engineering system is accomplished by midshipmen teams. Projects are selected to match student interest and vary each semester, but normally include such areas as coastal shore protection, marinas, offshore structures, tidal wetlands, artificial reefs, ocean energy systems, underwater vehicles, diving and life support systems. Design teams work independently and integrate detailed engineering design along with other project elements such as proposal writing, project management, cost estimating, report preparation, and oral presentation.

Offered: Spring

Requisites: Prereq: EN461.

Course: EN470

Title: LIFE SUPPORT SYSTEMS

Credits: 3-0-3

Description: The physiological and psychological aspects of man in the sea are presented with the related engineering requirements. Topics include hyperbaric physiology, saturation diving, life support equipment, deep dive systems, diving operations and hazards.

Offered: Spring

Requisites: Prereq: 1/C engineering major or approval of department chair.

Course: EN471

Title: SHIP DESIGN I

Credits: 2-2-3

Description: This course introduces the student to the requirements and procedures for accomplishing the design of a ship. The preliminary design of a small monohull displacement ship is developed. Relevant design resources and techniques are used.

Prereq: 1/C standing in naval architecture major.

Offered: Fall 2022-2023

Requisites: Prereq: 1/C standing in naval architecture major.

Course: EN475

Title: OCEAN ENGINEERING MECHANICS

Credits: 3-2-4

Description: This course investigates the properties of ocean surface waves and the effects of ocean waves on fixed and floating ocean structures. Laboratory experiments are an integral part of the course and include measurements of wave heights, fluid velocities and pressures, wave-induced forces and structure motions in waves. Computational skills are also emphasized both through extensive spreadsheet applications and through programming in MATLAB.

Offered: Spring

Requisites: Prereq: EM232, EM324, EN245 or approval of department chair.

Course: EN476

Title: SHIP DESIGN II

Credits: 0-6-3

Description: In this course, which represents the culmination of an undergraduate naval architecture program, the student applies engineering skills to the design of a ship.

Offered: Spring

Requisites: Prereq: EN471.

Course: EN478

Title: SUBMARINE & SUBMERSIBLE DESIGN

Credits: 3-0-3

Description: An introductory course in submarine and submersible design with topics in undersea vessel development through exploring historical development, buoyancy and stability, resistance and propulsion, mission requirements, auxiliary systems, structural design, construction methods and modern design approaches.

Offered: Fall 2022-2023

Requisites: Prereq: ENM or EOE major.

Course: EN503H

Title: HONORS SENIOR THESIS 1

Credits: 1-4-3

Description: This course includes a weekly recitation period which will cover research methodology, literature search, design of experiments, data collection and reduction, report preparation, publication of research, and ethical guidelines for research. In addition, with the guidance of a faculty advisor, students prepare analytical research papers based on a technical topic of their choice. Each student makes an oral presentation of their interim report before the NAOE faculty including their designated thesis committee.

Offered: Fall 2022-2023

Requisites: Prereq: Approval of the department chair.

Course: EN504H

Title: HONORS SENIOR THESIS 2

Credits: 0-6-3

Description: With the guidance of a faculty advisor, students prepare analytical research papers based on a technical topic of their choice. Each student makes an oral presentation of their final report before the NAOE Faculty Honors Committee and external readers.

Offered: Spring

Requisites: Prereq: Approval of the department chair.

Weapons, Robotics & Control Engineering Department Courses (EW)

Course: EW200

Title: INTRO TO PROGRAMMING & DESIGN

Credits: 3-2-4

Description: This course acts as an introduction to the robotics, and control engineering major, focusing on programming, and the development of hardware and software solutions to engineering problems. Using a project-based approach, the course ties together topics from the core, introduces the basics of technical communication and the design process.

Offered: Fall 2022-2023

Requisites: ERC/ERCH major or approval of the department chair.

Course: EW202

Title: PRINCIPLES OF MECHATRONICS

Credits: 2-2-3

Description: This second course in the robotics and control engineering major introduces concepts from control theory, instrumentation, and mechatronics, offering students a practical, hands-on introduction to these topics through the use of projects and laboratory exercises.

Offered:

Requisites: Prereq: EW200

Course: EW300

Title: NAVAL WEAPON SYSTEMS

Credits: 3-0-3

Description: An introduction to the theory of weapons systems through a study of the principles of sensor, tracking, delivery and destruction mechanisms.

Offered: Summer 2022-2023, Fall 2022-2023

Requisites: Prereq: Calculus II (SM122 or SM162) and Chemistry II (SC112 or SC151) and Physics II (SP212 or SP222).

Course: EW301

Title: SYSTEM MODELING AND SIMULATION

Credits: 2-2-3

Description: The course introduces modeling of physical systems including mechanical, electrical, and fluid systems. Also introduced are standard model representations, such as transfer functions and state space models, along with numerical methods and simulation software. Includes hands-on hardware laboratory exercises.

Offered: Fall 2022-2023

Requisites: Prereq: EW202 and EM232; Coreq: EW305 or EW305H.

Course: EW305

Title: LINEAR CONTROL ENGINEERING

Credits: 3-2-4

Description: This course provides a foundation in classical control engineering covering mathematical modeling, time and frequency response analysis, and design of PID compensators. The lecture material is supported by a series of laboratory projects on the modeling and analysis of physical systems and the design and implementation of control systems.

Offered: Fall 2022-2023

Requisites: Prereq: EW202. Coreq: EW301.

Course: EW305H

Title: HONORS LINEAR CONTROL ENGINEERING

Credits: 3-2-4

Description: This course provides a foundation in classical control engineering covering mathematical modeling, time and frequency response analysis, and design of PID compensators. The lecture material is supported by a series of laboratory projects

on the modeling and analysis of physical systems and the design and implementation of control systems. This honors course focuses on deeper analysis of the linear and advanced control toolsets and include an open-ended control design project.

Offered: Fall 2022-2023

Requisites: Prereq: EW202. Coreq: EW301.

Course: EW306

Title: ADVANCED CONTROL ENGINEERING

Credits: 2-2-3

Description: This course builds upon the foundation established in EW305 and covers the analysis and design of state-space control systems. Specifically, state feedback design control and state estimation methods are presented and supported by a series of laboratory projects on the design and implementation of state-space control systems for physical systems.

Offered:

Requisites: Prereq: EW301, EW305

Course: EW306H

Title: HONORS ADV CONTROL ENGINEERING

Credits: 2-2-3

Description: This course builds upon the foundation established in EW305H and covers the analysis and design of state-space control systems. Specifically, state feedback design control and state estimation methods are presented and supported by a series of laboratory projects on the design and implementation of state-space control systems for physical systems. This honors course focuses on deeper analysis of the linear and advanced control toolsets and include an open-ended control design project.

Offered:

Requisites: Prereq: EW301, EW305H

Course: EW309

Title: GUIDED DESIGN EXPERIENCE

Credits: 0-4-2

Description: Students pursue a semester-long structured and guided engineering design project, starting from a problem statement and carrying through to a final prototype design. Working in small groups, students participate in a project-based-learning exercise through which they develop the breadth of technical experience required for open-ended design on the large scale.

Offered:

Requisites: Prereq: EW305 or EW305H, EW301, SM316.

Course: EW370

Title: AUTONOMY & CONTROL IN NAVAL WEAPON SYSTEMS

Credits: 0-2-1

Description: An introduction to the fundamentals and design of autonomy for use in naval weapon systems. The course develops conceptual understanding and intuition through a series of hands-on experiences. Topics include fundamentals of feedback control theory and an introduction to the rapidly developing areas of machine learning and artificial intelligence as they relate to naval power.

Offered: Summer 2022-2023, Fall 2022-2023

Requisites: Co-requisite: EW300

Course: EW401

Title: ENGINEERING DESIGN METHODS

Credits: 2-2-3

Description: An introduction to the engineering design process and project management. Also, includes the composition of the proposal for the senior design project.

Offered: Fall 2022-2023

Requisites: Prereq: EW309.

Course: EW402

Title: HONORS ROBOTICS & CONTROL ENGR DESIGN

Credits: 2-4-4

Description: Final design, construction, test and evaluation of an approved project is accomplished in this course.

Offered:

Requisites: Prereq: EW502 and ERCH major.

Course: EW404

Title: ROBOTICS & CONTROL ENGR DESIGN

Credits: 1-4-3

Description: Final design, construction, test and evaluation of an approved project is accomplished in this course.

Offered:

Requisites: Prereq: EW401 or EW502.

Course: EW410

Title: INTRO TO CONTROL ENGINEERING

Credits: 3-2-4

Description: Linear control for engineering majors, using analytical, graphical, and computer techniques.

Offered: Fall 2022-2023

Requisites: Prereq: Physics II (SP212 or SP222), DE (SM212 or SM222), and Elec Eng I (EE221 or EE331).

Course: EW412

Title: CONTROL ENGINEERING FOR ELECTRICAL ENGR

Credits: 3-2-4

Description: Linear control engineering for Electrical Engineering majors using analytical, graphical and computer techniques. The course covers both the Frequency Domain and the State Space approaches to control design. Cannot receive credit for both EW412 and EW410.

Offered:

Requisites: Prereq: EE322 and EE353.

Course: EW413

Title: DIGITAL CONTROL ENGINEERING

Credits: 2-2-3

Description: Analysis, design and simulation of digital filters. Analysis, design and laboratory testing of digital controllers for continuous processes using digital and analog computers and servo system hardware.

Offered: Fall 2022-2023

Requisites: Prereq: EW305 or EW305H and EW306 or EW306H.

Course: EW417

Title: CONTROL OF MULTI-AGENT SYSTEMS

Credits: 2-2-3

Description: This course focuses on the control and coordination of multi-agent networked systems with emphasis in mobile robots. Topics include graph representation, connectivity, consensus, formation control, collision avoidance, coverage control, and the communication challenges these systems face.

Offered: Fall 2022-2023

Requisites: Prereq: EW306 or EW306H.

Course: EW418

Title: OPTIMAL CONTROL AND ESTIMATION

Credits: 2-2-3

Description: Analysis and design of control systems and estimators using optimal control theory.

Offered:

Requisites: Prereq: EW306 or EW306H.

Course: EW430

Title: EMBEDDED SYSTEMS

Credits: 2-2-3

Description: This is an applications focused introduction to embedded system design. Embedded systems are the electronic devices that surround us every day, from cell phones to fitness devices, smart watches, and more. This course emphasizes hands on design. Students are issued portable hardware kits used for weekly labs and a comprehensive final project. This course assumes a functional knowledge of C programming and familiarity with basic electronic circuits.

Offered: Fall 2022-2023

Requisites: Prereq: EW200, SP212, or instructor approval.

Course: EW432

Title: INTERNET OF THINGS

Credits: 2-2-3

Description: High speed wireless networks and powerful microcontrollers now allow almost anything to connect to the Internet. The proliferation of such devices is commonly called the "Internet of Things" (IoT). This course covers the fundamental technologies of IoT, including computer networks, the Linux operating system, the Python programming language, and popular web frameworks. Find out how to build your own IoT devices from the microcontroller to the web server and everything in between. This course assumes a functional knowledge of C programming, but no prior experience with Python or Linux is required.

Offered:

Requisites: Prereq: EW200, SP212, or instructor approval. Recommended: EW430

Course: EW450

Title: INTRODUCTION TO ROBOTIC SYSTEMS

Credits: 2-2-3

Description: Fundamentals of robotic systems including historical development, applications, manipulator configuration and design considerations, control principles of robotic systems, fundamental computer vision processing and group design projects. Laboratory exercises utilize networked PCs, various laboratory robot systems, and computer vision systems to investigate theoretical topics introduced during lectures.

Offered: Fall 2022-2023

Requisites: Prereq: EW200 and SM316.

Course: EW451

Title: MOBILE ROBOT DESIGN

Credits: 1-4-3

Description: An experimentation-based course in the design, analysis, construction, control and programming of autonomous mobile robots. Special topics include locomotion methodologies (including walking machine design), design for terrain, analog robot designs, alternative actuation techniques (Shape Memory Alloys, etc.), microprocessor selection and integration, motion planning, behavior-based program structures, and power supply systems. Eight to ten robots are constructed by each team throughout the semester using standard robotic construction kits. All topics are investigated through experimentation in the laboratory.

Offered:

Requisites: Prereq: EW450.

Course: EW452

Title: ADVANCED TOPICS IN ROBOTICS

Credits: 2-2-3

Description: Individual and group open ended investigations of selected advanced topics in the field of robotics, such as: advanced computer vision processing techniques, multiple robot manipulator systems, and artificial neural network systems.

Utilizes networked PCs, laboratory robots, computer vision systems.

Offered: Spring

Requisites: Prereq: EW450 or Dept Chair Approval

Course: EW453

Title: INTRO TO COMPUTER VISION

Credits: 2-2-3

Description: An introductory course covering both theory and application of image processing and pattern recognition techniques used for automation, medical imaging, and remote sensing.

Offered: Fall 2022-2023

Requisites: Prereq: EW200.

Course: EW456

Title: AUTONOMOUS VEHICLES

Credits: 2-2-3

Description: Advanced topics in dynamics, control and estimation as they apply to unmanned vehicles. Introduction to specifics of aerial, marine and ground vehicles. Laboratory exposure to navigation hardware and an open ended project.

Offered: Fall 2022-2023

Requisites: Prereq: 1/C ERC or ERCH major, or Dept Chair Approval.

Course: EW461

Title: QUANTITATIVE METHODS FOR MANAGEMENT

Credits: 3-0-3

Description: An introduction to Operations Research and its application to engineering. Topics include: optimization of engineering systems, game theory, sensitivity analysis, project management with PERT/CPM, and decision analysis.

Offered: Fall 2022-2023

Requisites: Prereq: ERC or ERCH major, or Dept Chair Approval.

Course: EW462

Title: EMERGING TECHNOLOGIES

Credits: 3-0-3

Description: Focuses on skills and toolsets for evaluation of new and emerging technologies using a sociotechnological development model. Includes discussions of basic science, state-of-the-art technologies and current research trends in a variety of emerging areas, including biotechnology, nanotechnology, cybernetics, etc. Credit cannot be received for both EW462 and EW503.

Offered: Spring

Requisites: Prereq: 1/C ERC major, or Dept Chair Approval.

Course: EW464

Title: SURVEY OF ENGINEERING ECONOMICS

Credits: 3-0-3

Description: This course provides a survey of material relevant to financial intertemporal decision making for engineering activities. Components of this course include traditional engineering economy topics; fundamentals of accounting and cash flow analysis, interest factors, a comparison of economic alternatives, effects of depreciation and capital budgeting, decision analysis, value of information & options applicable to the management of technical organizations. The skills used will be applied to a term project.

Offered:

Requisites: Prereq: 1/C ERC or ERCH major, or Dept Chair Approval.

Course: EW470

Title: DESKTOP MANUFACTURING AND PRODUCT DESIGN

Credits: 2-4-4

Description: This course focuses on the fundamental principles of commercial product design and prototyping using tools from desktop manufacturing, including 3-D printers, laser cutters, 3D scanners, vacuum formers, and printed circuit board (PCB)

manufacturing capabilities. Students are introduced to a wide array of tools, including CAD principles for desktop manufacturing, professional graphics software for documentation and promotion, and product design concepts ranging from usability to aesthetics. The course culminates in the generation of a novel product design including a fully functional prototype generated using the tools from the course. Cannot receive credit for both EW470 and EM434.

Offered: Fall 2022-2023

Requisites: Prereq: EW202, and ERC or ERCH major.

Course: EW502

Title: HONORS RESEARCH & DESIGN

Credits: 1-2-2

Description: Engineering design process and project management geared towards advanced projects associated with the Robotics and Control Engineering Honors Major. Includes the composition of the proposal for the honors senior research project.

Offered: Spring

Requisites: Prereq: 2/C ERCH major.

Course: EW503

Title: ADVANCED TECHNOLOGIES

Credits: 3-0-3

Description: This course provides students with background and insight into the implications of emerging technologies, focusing on the impact of these technologies from a global, societal perspective. Students use fundamental scientific and engineering skills to analyze state-of-the-art technologies and predict directions of future expansion and application of these systems. Sample topics include nanotechnology, cybernetics, genetic engineering, intelligent highway vehicle systems, etc. Credit cannot be received for both EW462 and EW503.

Offered: Spring

Requisites: Prereq: 1/C ERCH major.

Courses in the School of Humanities and Social Sciences

Economics Department Courses (FE, SE)

Course: FE210

Title: INTRODUCTORY ECONOMICS

Credits: 3-0-3

Description: A course in elementary economic theory with applications to contemporary problems. Topics include determination of GDP, price theory and market equilibrium, monetary and fiscal policy, unemployment, inflation and international trade.

Offered: Summer 2022-2023, Fall 2022-2023

Requisites: Prereq: None.

Course: FE220

Title: ACCOUNTING

Credits: 3-0-3

Description: This course provides an introduction to the basic principles of accounting. This course will emphasize how general-purpose financial statements communicate information about the business corporation's performance and position for users external to management. Approximately half of the course emphasizes how the accountant processes and presents the information and includes exposure to recording transactions, adjusting balances, and preparing financial statements for service and merchandise firms according to established rules and procedures. The remainder of the course examines major elements of the statements of the cash, receivables, inventory, long-lived assets, depreciation, payroll, bonds, and other liabilities and stocks. FE220 is designed for the student who has no prior exposure to accounting. The course covers a wide range of accounting topics. The central objective of the course is to assist students in developing an understanding and appreciation for basic accounting. Cannot be taken for Humanities/Social Science elective.

Offered: Fall 2022-2023

Requisites: Prereq: None.

Course: FE301

Title: FINANCIAL ANALYSIS

Credits: 3-0-3

Description: A study of the theory and techniques of financial analysis applied in the federal government and industry.

Offered: Fall 2022-2023

Requisites: Prereq: FE210, SE201, or approval of Dept Chair.

Course: FE310

Title: ECONOMIC GEOGRAPHY

Credits: 3-0-3

Description: Economic Geography provides a systematic understanding of economic growth and the issue of finite limits to improve living standards around the world. The course studies population growth, economic development in underdeveloped countries, pollution and resource depletion, food production and agriculture, patterns of land use, economic justice, Foreign Direct Investment (FDI), social development, the role of government and multinational/international commerce. The course will develop an understanding of the link between the world economy and geography in relation to globalization and economic development.

Offered: Fall 2022-2023

Requisites: Prereq: FE210, SE201, or approval of Dept Chair.

Course: FE311

Title: HISTORY OF ECONOMIC THOUGHT

Credits: 3-0-3

Description: Traces the evolution of economic doctrine from the ancients to modern day with emphasis on the period since the 18th century. Reviews the contributions to economic knowledge by Smith, Malthus, Ricardo, Marx, Mill, Marshall, Keynes

and others. Various schools of thought, including mercantilism, classical, neo-classical, historical, institutionalism and Keynesianism are examined.

Offered: Spring

Requisites: Prereq: FE210, SE201, or approval of Dept Chair.

Course: FE314

Title: INTERNATIONAL TRADE AND POLICY

Credits: 3-0-3

Description: Study of trade policy, institutions that shape trade policy and the impact of those policies on actual trade patterns, international capital flows and economic conditions and growth in different countries. Covered topics include: different exchange rate regimes and international monetary systems, role of the World Bank and the IMF, protection policies in the form of tariffs, quotas, voluntary exchange restraints and anti-dumping duties, multilateral free trade agreements and regional trade agreements and unions such as NAFTA, APEC and the European Union. (Spring.)

Offered: Fall 2022-2023

Requisites: Prereq: FE210, SE201, FP210, or permission of the Economics department chair.

Course: FE334

Title: FINANCIAL MARKETS AND INSTITUTIONS

Credits: 3-0-3

Description: A study of financial institutions and instruments covering their development and role within the economy and financial system. The forces creating the rapid changes of financial institutions and instruments in the 1980s and 1990s are explored, as well as the regulation of financial institutions and markets.

Offered: Fall

Requisites: Prereq: FE210, SE201, or approval of Dept Chair.

Course: FE335

Title: ECONOMICS OF NATIONAL DEFENSE

Credits: 3-0-3

Description: The application of economic analysis to defense decision-making and the consequences of defense decisions for weapons; volunteers vs. conscription; leaders vs. resource managers; competitive vs. monopoly contractors; pay vs. non-pay factors in reenlistment.

Offered: Fall 2022-2023

Requisites: Prereq: FE210, SE201, or approval of Dept Chair.

Course: FE337

Title: ECONOMICS OF THE DEFENSE INDUSTRIAL BASE

Credits: 3-0-3

Description: Application of economic principles to issues relating to military procurement and contracting, conversion of military industrial capacity to peacetime uses, wartime mobilization of industrial capacity, strategic stockpiling and economic warfare.

Offered: Spring

Requisites: Prereq: FE210, SE201, or approval of Dept Chair.

Course: FE342

Title: ECONOMIC METHODS FOR ENGINEERS

Credits: 3-0-3

Description: Application of microeconomic principles and analytical tools to the costing of investment projects in both private and public/military contexts.

Offered: Spring

Requisites: Prereq: FE210, SE201, or approval of Dept Chair.

Course: FE345

Title: ENVIRONMENTAL ECONOMICS

Credits: 3-0-3

Description: This course develops guiding economic principles for decision-making in the environmental arena. Important topics include population growth and the environment, the economics of pollution control, measuring environmental benefits, use and management of renewable and non-renewable resources, environmental justice, and the politics of environmental policy. Not offered every year.

Offered: Fall 2022-2023

Requisites: Prereq: FE210, SE201, or approval of Dept Chair.

Course: FE411

Title: ECONOMIC DEVELOPMENT AND GROWTH

Credits: 3-0-3

Description: This course provides a rigorous study of the current issues facing developing countries on both the individual and aggregate level. Discussed topics include economic models of growth, impact of physical and human capital investment, poverty and population growth, trade and globalization, government institutions, international capital flows, foreign aid, growth during times of structural change and reconstruction investment in war-torn societies. Individual country case studies may also be presented and social, political and historical differences between countries will be analyzed.

Offered: Fall 2022-2023

Requisites: Prereq: SE312.

Course: FE412

Title: INTERNATIONAL TRADE AND FINANCE

Credits: 3-0-3

Description: A rigorous examination of current international issues in a theoretical and empirical framework. Topics include motivations for trade; trade versus protectionism; the multinational enterprise; exchange rate issues and the international monetary systems and the role of the International Monetary Fund and World Bank.

Offered: Fall

Requisites: Prereq: SE312 or SE341.

Course: FE422

Title: LABOR ECONOMICS

Credits: 3-0-3

Description: This course analyzes theories of labor markets and evidence on whether and how labor market theories successfully analyze outcomes. The core material explores labor demand by profit-maximizing firms, labor supply decisions made by rational workers, and equilibrium patterns of employment and wages. Topics may include: the analysis of human capital, migration, the economics of discrimination, effects of unions on employment and wages, effects of legislation (such as minimum wages and payroll taxes) and recent trends in wage inequality.

Offered: Fall

Requisites: Prereq: SE341.

Course: FE431

Title: PUBLIC FINANCE

Credits: 3-0-3

Description: This course examines the role of government in a market economy including the use of government expenditures and taxation to change the allocation of resources and/or to change the distribution of income. Emphasis is given to the formation and analysis of public policies in education, health care, social security, welfare, and the environment. Proposals for tax reform and how to address long-term fiscal challenges are analyzed. This course counts as a 400-level elective for economics majors (FQE) and as an economics major elective for the mathematics with economics major (SME).

Offered: Summer 2022-2023

Requisites: Prereq: SE341.

Course: FE436

Title: BUSINESS CYCLES

Credits: 3-0-3

Description: An advanced treatment of the empirical and theoretical issues surrounding business cycles. Topics include empirical regularities of cycles, models of inventory cycles, labor and credit markets, technology shocks, and the international transmission of cycles. Simulation-based methods of analyzing such models, and the role of fiscal and monetary policy in economic stabilization, are included.

Offered: Spring

Requisites: Prereq: SE312.

Course: FE437

Title: MONETARY THEORY AND POLICY

Credits: 3-0-3

Description: An advanced study of topics in monetary economics and their application to macroeconomic issues. Consideration of the role of money as a medium of exchange in commodity and fiat systems. Theories of money demand and empirical measures of the money supply. Development of macroeconomic models of money and the effect of monetary policy on inflation, unemployment and economic growth.

Offered: Fall 2022-2023

Requisites: Prereq: SE312.

Course: FE438

Title: ECONOMICS OF FINANCIAL CRISES

Credits: 3-0-3

Description: This course explores in depth the causes and consequences of economic and financial crises in general, the contagion of such crises into other countries, and the policies used or proposed to prevent similar crises in the future. It examines numerous historical crises, both theoretically and empirically, in hopes of drawing parallels that may help to guide future economic policy. The course critically examines comments made by so called 'market experts' concerning the crisis and the government's response. It also provides a framework for understanding the likelihood of future crises and potential solutions.

Offered:

Requisites: Prereq: SE312.

Course: FE442

Title: HEALTH ECONOMICS

Credits: 3-0-3

Description: This course introduces students who have already taken Microeconomics to the field of health economics. Factors that distinguish the discipline of health economics include extensive government intervention, intractable uncertainty in several dimensions, asymmetric information, barriers to entry, externalities, and the presence of third-party agents (such as doctors). This course will cover a range of theoretical topics, including health production functions, consumer choice models of health behaviors (such as smoking), and the supply and demand of health care services. We will also study various international health systems as they compare to the health care system in the United States, both before and after the Affordable Care Act.

Offered: Fall 2022-2023

Requisites: Prereq: SE341

Course: FE461

Title: INDUSTRIAL ORGANIZATION

Credits: 3-0-3

Description: Industrial organization is the study of industry and firm behavior. Using microeconomic and game theory tools, this course explores the relationships among firms in an industry or across industries by examining the nature of strategic interaction among firms. The course will utilize available computer software to study theoretical models and empirical evidence for a wide variety of market phenomena such as price wars, patent races, price-fixing conspiracies, mergers, and advertising campaigns. It will consider public policies that affect the structure of markets and the behavior of firms, particularly antitrust laws, which try to create a balance between the benefits of coordination and consolidation and the detriments of market power. This

course counts as a 400-level elective for Quantitative Economics majors (FQE) and as an economics major elective for the Math with Economics major (SME).

Offered: Fall 2022-2023

Requisites: Prereq: SE341.

Course: FE467

Title: LAW AND ECONOMICS

Credits: 3-0-3

Description: This course introduces students to the relationship between law and economics by providing economic analysis of law and legal institutions. Using microeconomic analysis, rational choice theory, as an objective methodology, in this class we will estimate the economic efficiency arising from legal rules. Economists recognize that laws serve as an incentive for changes in people's behavior and that policy makers examine how laws impact efficiency and the distribution of income.

Offered:

Requisites: Prereq: SE341

Course: SE201

Title: PRINCIPLES OF MICROECONOMICS

Credits: 3-0-3

Description: Economics is a social science that is concerned with the study of resource allocation problems. Economists are most interested in the decisions of individuals, firms, and government policy makers in their pursuit of economic objectives. This course is intended as the first in a two-part introductory economics sequence to expose students to the basic principles that underlie the study of resource allocation decisions. Key topics include the understanding of production possibilities, gains from trade, consumer preferences and choice, costs of production, market exchange, and market structure. The course also introduces the important concepts of allocative efficiency, equity, market failure, and government failure, and discusses the potential role of government policy for promoting market efficiency and addressing inefficiency and equity concerns. Midshipmen who take SE201 cannot also receive credit for FE210.

Offered: Fall 2022-2023

Requisites:

Course: SE202

Title: PRINCIPLES OF MACROECONOMICS

Credits: 3-0-3

Description: This course is designed to provide you with an introduction to macroeconomic concepts and models used in economic and policy analysis. We will analyze the fundamentals of macroeconomic variables such as output, inflation, and unemployment. This course provides an introduction to the different modeling techniques economists use to understand both long term growth and the business cycle. In addition to learning the "nuts and bolts" of the models, you will learn how to apply the models to understand the possible effects of Fiscal and Monetary Policy. As part of the latter objective, throughout the course you will read examples of academic scholarship to see how economists employ the models in practice. Midshipmen who take SE202 cannot also receive credit for FE210.

Offered: Summer 2022-2023, Fall 2022-2023

Requisites:

Course: SE312

Title: MACROECONOMICS

Credits: 3-0-3

Description: A course on the theories of the aggregate level of income, employment and the price level. Includes discussion of determinants of economic growth, the interaction of the domestic economy with the world economy, and the formulation and impact of monetary and fiscal policy.

Offered: Fall 2022-2023

Requisites: Prereq: SE202.

Course: SE331

Title: ECONOMIC STATISTICS

Credits: 2-2-3

Description: Survey of descriptive and inferential statistical techniques involving more than one variable. Strong emphasis on regression analysis and use of computers.

Offered: Fall 2022-2023

Requisites: Prereq: SE201, SE202, and (SM230, SM239 or SM219).

Course: SE341

Title: MICROECONOMICS

Credits: 3-0-3

Description: Theories of the economic behavior of consumers and producers, the determination of final good and factor prices, market structures and general economic equilibrium. The application of price theory to business problems and public-policy issues.

Offered: Fall 2022-2023

Requisites: Prereq: SE201.

Course: SE401

Title: ADVANCED MICROECONOMIC THEORY

Credits: 3-0-3

Description: Advanced topics in modern microeconomics. Topics may include dynamic analysis, risk and decision making under uncertainty, general equilibrium analysis, welfare economics, game theory and strategic behavior, principal-agent problems, collective action and social dilemmas, and rational and "irrational" choice.

Offered: Fall 2022-2023

Requisites: Prereq: SE341 and (SE331 or SM339)

Course: SE402

Title: ADVANCED MACROECONOMIC THEORY

Credits: 3-0-3

Description: This course is designed as an advanced treatment of modern macroeconomics and policy analysis. Throughout the course we emphasize the role that imperfections play in the labor, product, and financial markets in short, medium, and long-run macroeconomics. The players in the economic model - the central bank, governments, employers, employees, and financial market institutions - operate strategically within a set framework. The model that we will develop and use is a mainstream monetary macro model used in current research and central banks for policy analysis.

Offered:

Requisites: Prereq: SE312 and (SE331 or SM339)

Course: SE435

Title: MACROECONOMIC FORECASTING

Credits: 3-0-3

Description: As a forward-looking discipline, economists use forecasting as the basis for private sector decision making. Moreover, businesses and governments forecast future revenues and costs. Macroeconomic Forecasting examines the modern, quantitative, statistical-econometric techniques of producing and evaluating forecasts of macroeconomic variables. The course introduces the fundamental techniques to analyze trend, seasonality, and cyclical fluctuations, univariate times series methods, and the development of econometric models of the economy.

Offered: Fall 2022-2023

Requisites: Prereq: SE312 and (SE331 or SM339).

Course: SE445

Title: ECONOMETRICS

Credits: 3-0-3

Description: Quantification of basic economic theory; multiple regression, correlation and identification techniques for the construction and testing of economic models and a study of selected alternative models of particular economic interest.

Offered: Fall 2022-2023

Requisites: Prereq: SE341, Calculus II, and (SE331 or SM339).

Course: SE450

Title: GAME THEORY

Credits: 3-0-3

Description: Game theory is the study of strategic behavior in situations where decision makers are aware of the interdependence of their actions. While game theory is widely applicable in social and biological sciences, this course introduces the basic notions of game theory with emphasis on economic applications such as auctions, oligopoly pricing, and entry deterrence. In particular, the course introduces students to the fundamental problems and solution concepts of non-cooperative game theory by examining both simultaneous and sequential move games, static and dynamic games, and games with imperfect, and asymmetric information.

Offered: Fall 2022-2023

Requisites: Prereq: SE341 and (SE331 or SM339).

Course: SE475

Title: RESEARCH SEMINAR IN ECONOMICS

Credits: 3-0-3

Description: The Research Seminar in Economics is an introduction to the practical work done by professional economists. Each student applies his/her knowledge of economic theory and quantitative methods to formulate a hypothesis in economic terms, investigate previous research in the specific topics, statistically test its validity, and interpret the policy implications of the results. As the final course in the economics major sequence, the Research Seminar helps to integrate material from several courses, introduces students to the sources of the relevant economics literature, provides practice in reading and critically evaluating quantitative research results, develops competence in use of the computer, and provides a forum for presenting and evaluating the results of student projects.

Offered: Spring

Requisites: Prereq: FQE major or permission of department chair.

Course: SE490

Title: PRE-HONORS SEMINAR

Credits: 1-0-1

Description: The pre-Honors seminar is for students interested in the Economics Honors Program. During the seminar, students will explore and develop potential topics for their Honors theses. Students will also meet with potential faculty advisers doing research in a similar area of interest. The objective of the pre-Honors seminar is for students to identify both a research topic and a faculty Honors adviser, and to submit a proposal for an Honors project to be completed during first-class year.

Offered:

Requisites: Prereq: FQE major.

Course: SE500

Title: HONORS RESEARCH I

Credits: 2-0-2

Description: The Honors Research I course provides an opportunity for students in the Economics Honors Program to conduct advanced research under the guidance of a faculty Honors adviser.

Offered: Fall

Requisites: Prereq: 1/C FQEH major.

Course: SE502

Title: HONORS RESEARCH II

Credits: 3-0-3

Description: The Honors Research II course provides an opportunity for students in the Economics Honors program to continue to conduct advanced research under the guidance of a faculty Honors adviser.

Offered: Fall 2022-2023

Requisites: Prereq: SE500

English Department Courses (HE)

Course: HE044

Title: PRACTICAL WRITING LABORATORY

Credits: 0-2-1

Description: This course provides intensive, focused instruction in writing grammatically correct and rhetorically effective prose.

Offered: Fall, Spring

Requisites: Prereq: Recommendation of ADAA; Coreq: HE344.

Course: HE101

Title: PRACTICAL WRITING

Credits: 3-0-3

Description: The study and practice of grammatically correct and rhetorically effective expository prose, supplemented by the analysis of essays by professional writers. For students selected by English Department.

Offered: Fall 2022-2023

Requisites: Prereq: Placement by the department chair.

Course: HE111

Title: RHETORIC AND INTRO TO LITERATURE I

Credits: 3-0-3

Description: The first of a two course sequence stressing the writing of rhetorically effective and grammatically correct expository prose. During the first semester students read essays, short stories and plays, and they write brief essays. During the second semester students read novels and poetry and write longer essays.

Offered: Fall 2022-2023

Requisites: Prereq: None.

Course: HE112

Title: RHETORIC AND INTRO TO LIT II

Credits: 3-0-3

Description: Continuation of HE111. See HE111 for a listing of topics.

Offered: Fall, Spring

Requisites: Prereq: HE111.

Course: HE217

Title: ANCIENT AND MEDIEVAL LITERATURE

Credits: 3-0-3

Description: A balanced survey of the Western literary tradition and its backgrounds, from ancient Greece through the Middle Ages. Readings may include classical Greek and Roman epic, drama, and philosophy; selections from the Bible; and medieval poetry, drama, and philosophy.

Offered: Fall 2022-2023

Requisites:

Course: HE222

Title: THE BIBLE AND LITERATURE

Credits: 3-0-3

Description: The Bible and its influence on European and American literature. Emphasis will be placed on modern biblical literary-critical methodology and on the symbolic richness of derivative literature from Dante to Nikos Kazantzakis.

Offered: Summer 2022-2023

Requisites: Prereq: None.

Course: HE224

Title: LITERATURE AND SCIENCE

Credits: 3-0-3

Description: The interrelationships among science, technology, and literature. The course considers both the impact of science on literature and the implications of science as reflected in literary responses.

Offered: Fall

Requisites: Prereq: None.

Course: HE242

Title: METHODS OF LITERARY ANALYSIS

Credits: 3-0-3

Description: This course is designed to introduce new majors to tools of professional literary analysis through a set of focused readings.

Offered: Fall 2022-2023

Requisites:

Course: HE250

Title: LITERATURE OF THE SEA

Credits: 3-0-3

Description: Study of sea literature from the epic to the novel, with an emphasis on literary qualities, human relationships with the sea, and problems of command.

Offered: Spring, Summer

Requisites: Prereq: None.

Course: HE260

Title: LITERATURE OF WAR

Credits: 3-0-3

Description: A multi-genre survey of war and its consequences as represented in classic and contemporary literature with an emphasis on such issues as individual responsibility, leadership, societal values, and military culture.

Offered: Fall 2022-2023

Requisites: Prereq: None.

Course: HE301

Title: PATTERNS IN DRAMA

Credits: 3-0-3

Description: A study of drama, emphasizing reading, viewing, and analyzing dramatic literature and performance.

Offered: Fall 2022-2023

Requisites: Prereq: HE111 and HE112.

Course: HE302

Title: FORMS OF POETRY

Credits: 3-0-3

Description: A study in the analysis of poetic form and expression.

Offered: Fall 2022-2023

Requisites: Prereq: HE111 and HE112.

Course: HE306

Title: TYPES OF FICTION

Credits: 3-0-3

Description: A study of the novel and short story with particular emphasis on the conventions, techniques, and innovations in the form.

Offered: Fall 2022-2023

Requisites: Prereq: HE111 and HE112.

Course: HE307

Title: TOPICS IN FILM AND LITERATURE

Credits: 3-0-3

Description: A study of American, European, and world film in conjunction with relevant literary works.

Offered: Summer 2022-2023, Fall 2022-2023

Requisites: Prereq: HE111 and HE112.

Course: HE313

Title: CHAUCER AND THE MEDIEVAL WORLD

Credits: 3-0-3

Description: The literary and philosophical traditions of Chaucer, the Gawain poet, and other contemporaries, including early and late medieval writers from England and the continent.

Offered: Fall 2022-2023

Requisites: Prereq: HE111 and HE112.

Course: HE314

Title: THE RENAISSANCE MIND

Credits: 3-0-3

Description: Literature and thought of the period bracketed by the two great English epics, Spenser's Faerie Queene and Milton's Paradise Lost. The course includes a continental perspective, with readings from such authors as Machiavelli, Rabelais, Cervantes, Montaigne and Castiglione.

Offered: Fall 2022-2023

Requisites: Prereq: HE111 and HE112.

Course: HE315

Title: RESTORATION AND EIGHTEENTH-CENTURY LITERATURE

Credits: 3-0-3

Description: The literature of the period 1660-1780. Readings may include the plays, novels, satires, and poetry of such writers as Behn, Dryden, Swift, Defoe, Fielding, Pope, Steele, Sheridan, and Johnson.

Offered: Fall

Requisites: Prereq: HE111 and HE112.

Course: HE317

Title: THE ROMANTIC PERIOD

Credits: 3-0-3

Description: Literature and culture of the Romantic period in Britain from the 1780s to the 1830s. Readings may include works by such writers as Blake, Wordsworth, Coleridge, Austen, the Shelleys, Byron, and Keats.

Offered: Fall 2022-2023

Requisites: Prereq: HE111 and HE112.

Course: HE318

Title: MODERN BRITISH LITERATURE

Credits: 3-0-3

Description: The literature of Great Britain and Ireland since 1900. Readings may include the novels of Conrad, Joyce, Lawrence, Woolf, and Lessing; the plays of Shaw, Synge, O'Casey, and Pinter; the poetry of Hardy, Yeats, Eliot, Auden, and Dylan Thomas.

Offered: Spring

Requisites: Prereq: HE111 and HE112.

Course: HE319

Title: VICTORIAN LITERATURE

Credits: 3-0-3

Description: British literature from the 1830s to the end of the nineteenth century. Readings may include works from such authors as Dickens, the Brontes, George Eliot, Hardy, Tennyson, the Brownings, Arnold, Carlyle, and Darwin.

Offered: Spring

Requisites: Prereq: HE111 and HE112.

Course: HE320

Title: CONTEMPORARY BRITISH LIT.

Credits: 3-0-3

Description: British Literature from 1945 to the present day. Reading may include the novels of Orwell, Greene, Murdoch, Naipaul, Barnes, Ishiguro, and Zadie Smith; the plays of Beckett, Pinter, Orton, Stoppard, Churchill, and Friel; and the poetry of Larkin, Heaney, Hughes, Gunn, and Motion.

Offered: Fall

Requisites: Prereq: HE111 and HE112.

Course: HE326

Title: AMERICAN LIT, 1607-1860

Credits: 3-0-3

Description: A survey of American literature including the Native American tradition from European settlement to the Civil War, emphasizing the relationship between the emerging culture and literature. Readings may include works from such authors as Bradford, Bradstreet, Franklin, Wheatley, Cooper, Emerson, Thoreau, Poe, Hawthorne, Melville, and Douglass.

Offered: Fall

Requisites: Prereq: HE111 and HE112.

Course: HE328

Title: AMERICAN LIT, 1860-1914

Credits: 3-0-3

Description: A survey of American literature from the Reconstruction through the Gilded Age, emphasizing the rise of realism and naturalism. Readings may include works from such authors as Whitman, Dickinson, Twain, Howells, Crane, Dreiser, Chesnutt, Chopin, James, and Wharton.

Offered: Fall 2022-2023

Requisites: Prereq: HE111 and HE112.

Course: HE329

Title: AMERICAN LIT, 1914-1945

Credits: 3-0-3

Description: A survey of American literature between the wars. Readings may include works by such authors as Stein, Eliot, Faulkner, Fitzgerald, Hemingway, Hughes, Hurston, Larsen, O'Neill, Steinbeck, West, and Wright.

Offered: Fall 2022-2023

Requisites: Prereq: HE111 and HE112.

Course: HE330

Title: AMERICAN LIT, 1945-PRESENT

Credits: 3-0-3

Description: A survey of American literature and culture since World War II. Readings may include works by such authors as Ellison, Ginsberg, Lowell, Bishop, Baraka, Heller, Pynchon, Bellow, Plath, Sexton, Rich, Roth, Updike, DeLillo, Mamet, McCarthy, and Morrison.

Offered: Spring

Requisites: Prereq: HE111 and HE112.

Course: HE333

Title: SHAKESPEARE

Credits: 3-0-3

Description: A study of a representative sample of Shakespeare's tragedies, histories, and comedies. Readings may also include works by Shakespeare's contemporaries.

Offered: Fall 2022-2023

Requisites: Prereq: HE111 and HE112.

Course: HE343

Title: CREATIVE WRITING

Credits: 3-0-3

Description: An introduction to the writing of prose, poetry, and drama.

Offered: Summer 2022-2023, Fall 2022-2023

Requisites: Prereq: HE111 and HE112.

Course: HE344

Title: PROFESSIONAL COMMUNICATION

Credits: 3-0-3

Description: A study of advanced methods of presenting information in a wide variety of forms. Assignments may include preparing articles, reports, and military documents. Students may be asked to design and present a persuasive or analytical speech.

Offered: Summer 2022-2023, Fall 2022-2023

Requisites: Prereq: HE111 and HE112.

Course: HE360

Title: SPECIAL TOPICS IN LITERATURE

Credits: 3-0-3

Description: An open-topics literature course. Specialized offerings vary from semester to semester.

Offered: Fall 2022-2023

Requisites: Prereq: HE111 and HE112.

Course: HE371

Title: AFRICAN AMERICAN STUDIES

Credits: 3-0-3

Description: This course examines historical periods and aesthetic movements, such as orality and the protest tradition, and major figures in African American literature such as Frederick Douglass, Maya Angelou, and Toni Morrison.

Offered: Fall 2022-2023

Requisites: Prereq: HE112

Course: HE372

Title: ASIAN AMERICAN STUDIES

Credits: 3-0-3

Description: This course will investigate Asian American cultural expressions, including responses to stereotypes, such as the model minority and the yellow peril, by studying works by major authors such as Sui Sin Far, Jhumpa Lahiri, Yone Noguchi, Hisaye Yamamoto, Carlos Bulosan, and Maxine Hong Kingston.

Offered:

Requisites: Prereq: HE112

Course: HE373

Title: LATINX STUDIES

Credits: 3-0-3

Description: The course concentrates on fiction and non-fiction works about the Latinx experience in the United States. Throughout the semester students will analyze how literature can work as a gateway to explore processes of identity formation through many of its facets, including: class, race, gender, sexuality, and language (among others). Possible authors to be discussed include: Piri Thomas, Rudolfo Anaya, Sandra Cisneros, Cristina Garcia, Junot Diaz and Cristina Henriquez, among many others.

Offered: Fall 2022-2023

Requisites: Prereq: HE112

Course: HE374

Title: GENDER AND SEXUALITY STUDIES

Credits: 3-0-3

Description: Advanced methods of analyzing literature and culture are taught through a set of focused readings of theories, histories, perspectives, and/or major figures in LGBTQ, women's and/or gender studies. Readings may include Audre Lorde, Sarah Ahmed, Gloria Anzaldua, and Kimberle Crenshaw.

Offered:

Requisites: Prereq: HE112

Course: HE375

Title: NATIVE AMERICAN STUDIES

Credits: 3-0-3

Description: This course explores the aesthetics, traditions, and concerns of Native American and First Nations peoples through multiple genres of literature from major authors such as Sherman Alexie, Paula Gunn Allen, Marie Clements, Vine Deloria Jr., Pauline Johnson, and Gerald Vizenor.

Offered:

Requisites: Prereq: HE112

Course: HE442

Title: LITERARY THEORY

Credits: 3-0-3

Description: A survey of key problems, figures, and texts in the history of literary and cultural thought. Required of all honors English majors.

Offered: Fall

Requisites: Prereq: one 300-level English course.

Course: HE461

Title: STUDIES IN A LITERARY PERIOD

Credits: 3-0-3

Description: In-depth study of a limited period in literary history. For example: the Augustan period, the beginnings of Romanticism, the fin de siècle, and the 1960s in American literature.

Offered: Fall 2022-2023

Requisites: Prereq: one 300-level English course and permission of the department chair.

Course: HE462

Title: STUDIES IN A LITERARY PROBLEM

Credits: 3-0-3

Description: In-depth study of a problem that cuts across traditional divisions of nationality, historical period, or genre. For example, myth and symbol in literature, literature and science, the concept of the hero.

Offered: Fall 2022-2023

Requisites: Prereq: one 300-level English course and permission of the department chair.

Course: HE463

Title: STUDIES IN LITERARY FIGURES

Credits: 3-0-3

Description: Extensive reading in the works, biography, and criticism of major figures in world literature. For example: Milton, Wordsworth, George Eliot, Dickens, Dostoevsky, O'Neill, Melville, Faulkner, Stevens, Morrison.

Offered: Fall

Requisites: Prereq: one 300-level English course and permission of the department chair.

Course: HE467

Title: STUDIES IN A LITERARY GENRE

Credits: 3-0-3

Description: Study in a special genre. For example, the epic, the autobiographical novel, science fiction, imagist poetry.

Offered: Spring

Requisites: Prereq: one 300-level English course and permission of the department chair.

Course: HE503

Title: SEMINAR IN ARTS & LITERATURE

Credits: 3-0-3

Description: An interdisciplinary honors seminar concerning a special topic in literature and the arts.

Offered: Fall 2022-2023

Requisites: Prereq: 1/C Honors English majors or by permission of the department chair; Coreq: HE521.

Course: HE504

Title: SEMINAR IN AN ADVANCED TOPIC

Credits: 3-0-3

Description: A concentrated honors seminar exploring individual literary works or issues.

Offered: Spring

Requisites: Prereq: 1/C Honors English majors or by permission of the department chair; Coreq: HE522.

Course: HE521

Title: HONORS SUPPLEMENT I

Credits: 1-0-1

Description: Focused study of a topic generated in HE503.

Offered: Fall 2022-2023

Requisites: Prereq: None; Coreq: HE503.

Course: HE522

Title: HONORS SUPPLEMENT II

Credits: 1-0-1

Description: Focused study of a topic generated in HE504.

Offered:

Requisites: Prereq: None; Coreq: HE504.

History Department Courses (HH)

Course: HH104

Title: AMERICAN NAVAL HISTORY

Credits: 3-0-3

Description: This course examines the antecedents, origins and development of the United States Navy and Marine Corps within the framework of America's growth as a continental and, eventually, global power, with particular emphasis on the development of naval and maritime strategy.

Offered: Fall 2022-2023

Requisites: Prereq: None.

Course: HH200

Title: THE HISTORIAN'S CRAFT

Credits: 3-0-3

Description: Organized around a topic of the instructor's choice, this first of three required History Major seminars introduces 3/C majors to the intellectual and structural origins of the modern discipline of history, including subfields of history and methodological approaches. Students learn to analyze scholarly articles and monographs and to critically read and interpret original primary sources (written and visual). They also learn how to do online historical research and how to navigate traditional and digital archives. Students pose a research question and pursue a research design, including a mini-prospectus along with an annotated bibliography.

Offered: Fall 2022-2023

Requisites: Prereq: 3/C HHS major; Coreq: HH215/A/M.

Course: HH215

Title: THE WEST IN THE PREMODERN WORLD

Credits: 3-0-3

Description: This course analyzes the historical evolution of ethical thought and its impact upon European society and culture from Antiquity to the Enlightenment in a comparative context of world religions and values. By studying the cultural expressions of Western ethical concerns, ideals and aspirations in light of other civilizations, this course broadens knowledge of the West's global context, cultivates the development of critical thinking about human beings and their societies, and deepens understanding of the competing values, institutions, and challenges of the modern West. The course fulfills the graduation requirement listed on matrices as HH2XY.

Offered: Summer 2022-2023, Fall 2022-2023

Requisites: Prereq: None.

Course: HH215A

Title: ASIA IN THE PREMODERN WORLD

Credits: 3-0-3

Description: This course is designed to provide an alternative to HH215 The West in the Pre-Modern World. It introduces students to pre-modern Asian civilization, including China, India, Japan and Southeast Asia. This course traces the dynamic manifestations of cultural, political, military and intellectual patterns, and examines them through a global perspective. Students will study ancient Asian societies, cultures, and ethical thought in comparison with other world traditions including Classical, Judeo-Christian and Islamic cultures. The course fulfills the graduation requirement listed on matrices as HH2XY.

Offered: Fall 2022-2023

Requisites: Prereq: None.

Course: HH215M

Title: THE MIDDLE EAST IN THE PREMODERN WORLD

Credits: 3-0-3

Description: This course is designed to provide an alternative to HH215 "The West in a Global Context". It introduces students to pre-modern Middle Eastern civilizations. This course traces the dynamic manifestations of cultural, political, military and intellectual patterns, and examines them through a global perspective. Topics include Middle Eastern ways of war. Moreover,

students will encounter ancient Middle Eastern sages and their ethical ruminations not only in their own regard, but also in comparison with their counterparts in other world traditions including Classical, Asian, Judeo-Christian and Islamic cultures. The course fulfills the graduation requirement listed on matrices as HH2XY.

Offered: Fall 2022-2023

Requisites: Prereq: None.

Course: HH216

Title: THE WEST IN THE MODERN WORLD

Credits: 3-0-3

Description: Focusing chiefly on the period from the 18th century to the present, this course analyzes the most significant political, social, intellectual and economic trends that have shaped contemporary societies. HH216 examines the global impact of European and American cultures over the past three centuries and explores the most important reactions to modernity in both Western and non-Western societies. In doing so, the course situates the West in a global context and prepares students to think critically and comparatively about a changing world.

Offered: Summer 2022-2023, Fall 2022-2023

Requisites: Prereq: None.

Course: HH300

Title: RESEARCH IN HISTORY

Credits: 3-0-3

Description: In this second of three required History Major seminars, 2/C students, building on the skills introduced in HH200, now choose their own independent topic and produce a 15-page research project proposal/paper. The proposal must propose a question/opportunity to contribute to historical knowledge based on analysis of the relevant secondary literature. The proposal also must show the project to be achievable by specifying an appropriate methodology and identifying the primary sources necessary to address the question/opportunity. Students are encouraged to further develop and complete their projects during 1/C year by enrolling in HH400B: Capstone Seminar: Research Essay.

Offered: Fall 2022-2023

Requisites: Prereq: HH200 and 2/C History Major

Course: HH304

Title: HISTORICAL READINGS IN GRAND STRATEGY

Credits: 3-0-3

Description: A consideration of the theory and practice of grand strategy from a variety of perspectives in historical contexts ranging from Ancient Greece to the contemporary United States. Midshipmen learn to frame actions and decisions in the broadest possible framework of consequences and outcomes, and become sensitive to the logic and intellectual vocabulary of policy discourse at the highest levels of statecraft. Reading, writing, and discussion intensive.

Offered:

Requisites: Coreq: HH216

Course: HH306

Title: RACE AND WARFARE IN THE BRITISH EMPIRE

Credits: 3-0-3

Description: Focusing largely on the period since 1850, this course examines the intersection of ideas and culture in the military campaigns of the British Empire. In analyzing how understandings of human difference shaped military activities, the course highlights the importance of cultural ideas to the history of warfare. By the end, midshipmen will be able to think critically and historically about the development of ideas of race and its importance in their professional lives.

Offered:

Requisites: Prereq: None Coreq: HH216

Course: HH311

Title: ATHENS: MILITARY DEMOCRACY

Credits: 3-0-3

Description: Examines the origins of Western democracy in 5th-century B.C. Athens. Focus is on the problems of democratic constitutions in settling foreign policy, surviving extended wars, administering foreign territories and dealing with questions of inequality at home.

Offered: Fall

Requisites: Prereq: None; Coreq: HH215 or HH215A.

Course: HH312

Title: IMPERIAL ROME

Credits: 3-0-3

Description: Study of the most successful of Western states with emphasis on models for bureaucratization, military defense and the incorporation of various ethnic groups.

Offered: Spring

Requisites: Prereq: None; Coreq: HH215 or HH215A.

Course: HH315

Title: THE AGE OF CHIVALRY AND FAITH

Credits: 3-0-3

Description: This course will familiarize students with the world of those who fought, prayed, and worked in western, eastern, and southern Europe between about 1000 and 1350 CE. In particular, the class will focus on the development of lordship, rulership, and medieval states; power and coerciveness in the medieval countryside; the appearance and forms of medieval chivalry; the variability of medieval Christianity and the enthusiasm and anxieties it produced; encounters and conflict with religious and ethnic "others" in medieval minds and experiences; and the global aspects of the medieval world.

Offered: Fall 2022-2023

Requisites: Coreq: HH215x

Course: HH316

Title: AGE OF RELIGIOUS WARS

Credits: 3-0-3

Description: Focuses on the emergence of modern civilization (1500-1763) from the discoveries and rediscoveries of the Renaissance, the sweeping changes brought by the Reformation and Counter-Reformation and the excitement of both scientific and political revolution.

Offered: Fall

Requisites: Prereq: None; Coreq: HH215 or HH215A.

Course: HH322

Title: THE RISE AND FALL OF SOVIET COMMUNISM

Credits: 3-0-3

Description: An examination of the Revolution of 1917 and the development of the Soviet Union, emphasizing the institutions and policies adopted to meet domestic and foreign problems.

Offered: Spring

Requisites: Prereq: None; Coreq: HH216.

Course: HH326

Title: IRELAND AND THE IRISH

Credits: 3-0-3

Description: This course presents the history of Ireland from the early Christian era to the present, with concentration on the past two centuries. The Great Famine, the independence movement, and the recent "Troubles" are examined in depth. Themes include Ireland's status as Britain's first colony, the role of literature and religion in forming Irish identity, and the "diaspora" of Irish people abroad.

Offered: Fall

Requisites: Prereq: None; Coreq: HH216.

Course: HH327

Title: GERMANY AND THE NAZI EXPERIENCE

Credits: 3-0-3

Description: Focuses on the antecedents of national socialism, including the Second Reich and World War I eras, the Nazi experience itself, and the legacy it bequeathed to today's German state.

Offered: Fall

Requisites: Prereq: None; Coreq: HH216.

Course: HH329

Title: MODERN FRANCE: NAPOLEON TO THE GREAT WAR

Credits: 3-0-3

Description: This course examines the history of modern France from the fall of the Old Regime to the end of World War I, known by historians as the "long nineteenth century." We will study the rise and fall of Napoleon, the development of parliamentary democracy and industrial society, and the impact of French military expansion both in Europe and the rest of the world. Midshipmen will consider how French citizens negotiated the legacies of the French Revolution and Napoleonic Regime into the twentieth century and how a century of revolutions and wars transformed France and the modern world.

Offered:

Requisites: Coreq: HH216

Course: HH330

Title: THE BRITISH EMPIRE AND ITS PEOPLES

Credits: 3-0-3

Description: The British Empire from 1815 to the present. The course examines the political, economic, and cultural systems that impelled British expansion and looks at the consequences of imperial rule on both the rulers and the subjects of the empire. At its end, the course highlights the collapse of the empire and the legacies of British imperialism in the modern world.

Offered:

Requisites: Coreq: HH216

Course: HH331

Title: ART AND IDEAS IN MODERN EUROPE

Credits: 3-0-3

Description: Explores the transformation of culture in the modern world. Examines how artists and intellectuals reacted to the long-range impacts of the democratic and industrial revolutions. Emphasis is placed on development of the fine arts in relation to pivotal ideas from 1750 to present.

Offered: Fall

Requisites: Prereq: None; Coreq: HH216.

Course: HH332

Title: WAR & SOCIETY IN 18TH CENTURY BRITAIN

Credits: 3-0-3

Description: The development of Britain from the Glorious Revolution to the Battle of Waterloo. The course examines the wars fought between Britain and France in the eighteenth century and examines the political, economic, and military origins of Britain's success. In analyzing the structural basis for British success, the course highlights the transformation of Britain over the course of the eighteenth century.

Offered:

Requisites: Prereq: None. Coreq: HH216

Course: HH337

Title: TOPICS IN EUROPEAN HISTORY

Credits: 3-0-3

Description: An open topics history course. Topics vary from semester to semester and cover a variety of specialized themes or eras in European history which are unique or too unusual to be integrated into the regular curriculum.

Offered: Fall

Requisites: Prereq: None.

Course: HH345

Title: COLONIAL AMERICA

Credits: 3-0-3

Description: Examines the ways in which three diverse cultures--Indian, European, and African--converged on the North American land mass before the American Revolution; topics include French, Spanish, and English exploration and settlement patterns, European-Indian encounters, gender, witchcraft, religion, slavery and race, the family, political ideas and institutions, and war and warmaking.

Offered: Fall

Requisites: Prereq: None; Coreq: HH216.

Course: HH346

Title: REVOLUTIONARY AMERICA AND THE EARLY REPUBLIC

Credits: 3-0-3

Description: Covers the remarkable transformation in American society from 1760 to 1820 as thirteen separate and distinct colonies struggled ideologically, militarily, and politically to establish a governmental and social system that would suit the needs of a large, diverse, and rapidly expanding population. The background to the Revolution, the actual conduct of the war, and the construction of state and national governments are treated in detail.

Offered: Fall 2022-2023

Requisites: Prereq: None; Coreq: HH216.

Course: HH347

Title: CIVIL WAR AND RECONSTRUCTION

Credits: 3-0-3

Description: An examination of the political, economic and social developments from the origins of the Civil War to 1896, including the wounding of the nation in a civil war and the subsequent reunification.

Offered: Fall 2022-2023

Requisites: Prereq: None; Coreq: HH216.

Course: HH349

Title: EMERGENCE OF MODERN AMERICA 1896-1945

Credits: 3-0-3

Description: Examination of political, social, intellectual, diplomatic and economic aspects of American history from the Spanish-American War to the end of World War II. Special emphasis is placed on Progressivism, the emergence of the U.S. as a great power in World War I, the Depression and the New Deal, and World War II.

Offered: Fall

Requisites: Prereq: None; Coreq: HH216.

Course: HH350

Title: UNITED STATES SINCE WORLD WAR II

Credits: 3-0-3

Description: A detailed examination of American history since 1945, including the onset of the Cold War in the 1950s, the domestic and foreign policy issues of the 1960s, Vietnam, Watergate and the Reagan era.

Offered: Spring

Requisites: Prereq: None; Coreq: HH216.

Course: HH352

Title: FILM AND AMERICAN SOCIETY

Credits: 2-2-3

Description: This course explores the relations between motion pictures and the political/cultural life during the period 1930-1943. Films are studied as documents of an era and the extent to which they offer insights for historical understanding are considered.

Offered: Spring

Requisites: Prereq: None; Coreq: HH216.

Course: HH353

Title: AMERICAN SOCIAL HISTORY

Credits: 3-0-3

Description: An examination of American life and culture and the forces that have shaped them, emphasizing mass media, popular entertainment, religious movements and technological advances.

Offered: Fall

Requisites: Prereq: None; Coreq: HH216.

Course: HH354

Title: AMERICA IN WORLD AFFAIRS

Credits: 3-0-3

Description: Surveys U.S. foreign relations from the colonial era to recent times, focusing on America's transformation from a colony to a preeminent world power. Examines the causes and international consequences of this dramatic shift, with particular emphasis on the twentieth century--the era of America's greatest influence on world affairs.

Offered: Fall 2022-2023

Requisites: Prereq: None; Coreq: HH216.

Course: HH355

Title: ART AND IDEAS IN AMERICAN SOCIETY

Credits: 3-0-3

Description: Examines the growth and development of intellectual concepts and artistic creativity in America from colonial times to the present. Emphasizes both the peculiarities of American creative and intellectual accomplishments and the place of those achievements in the broader Western tradition.

Offered: Spring

Requisites: Prereq: None; Coreq: HH216.

Course: HH357

Title: TOPICS IN U.S. HISTORY

Credits: 3-0-3

Description: An open topics history course. Topics vary from semester to semester and cover a variety of specialized themes or eras in American history which are unique or too unusual for integration into the regular curriculum.

Offered: Spring

Requisites: Prereq: None.

Course: HH360

Title: U.S. SECTIONAL HISTORY: THE SOUTH

Credits: 3-0-3

Description: Surveys the growth and development of the American South with specific attention to the plantation economy and slavery, the Confederate experience, the rise of segregation and the Second Reconstruction.

Offered: Spring

Requisites: Prereq: None; Coreq: HH216.

Course: HH361

Title: HISTORY OF EAST ASIA

Credits: 3-0-3

Description: An analysis of contemporary Asian problems which considers their cultural and institutional origins, their 19th-century development under the impact of western influence and their culmination in contemporary Asian nationalism.
Offered: Fall 2022-2023
Requisites: Prereq: None; Coreq: HH216.

Course: HH362

Title: HISTORY OF THE MIDDLE EAST

Credits: 3-0-3

Description: A long-range historical approach to the Middle East's role in world affairs and the development of its cultural, political and military institutions. Emphasis is placed on strategic and diplomatic considerations.

Offered: Fall 2022-2023

Requisites: Prereq: None; Coreq: HH216.

Course: HH363

Title: MODERN LATIN AMERICA

Credits: 3-0-3

Description: The evolution of Latin American societies from independence to the present will be studied. Analyses of social and political issues like slavery, race, immigration, popular religion, militarism, dictatorship, and revolution will be the focus of the course. Particular emphasis will be placed on Argentina, Mexico, Brazil, Peru, Chile, and Cuba.

Offered: Spring

Requisites: Prereq: None; Coreq: HH216.

Course: HH364

Title: CONTEMPORARY AFRICA

Credits: 3-0-3

Description: This course is an examination of Africa's history from roughly the year 1800 to the present, with emphasis on the dramatic cultural, political, and economic shifts the continent has experienced over the past two centuries. It approaches Africa's history through a multidisciplinary lens, by exploring the work of historians, journalists, anthropologists, and political scientists. Students will also learn from novels, memoirs, and documentaries. Overall, the objective of the course is to introduce students to some of the most remarkable transitions the continent has experienced in recent times, and to assess how Africans have responded to and developed new political and economic systems, technologies, and religious ideas.

Offered:

Requisites: Coreq: HH216

Course: HH365

Title: COLONIAL LATIN AMERICA

Credits: 3-0-3

Description: The Spanish and Portuguese conquests of and encounters with indigenous communities in the Americas including a focus on military campaigns, imperial policies, race and ethnicity, slavery, and church-state relations through the Independence Era.

Offered:

Requisites: Coreq: HH215x

Course: HH366

Title: WAR AND CONFLICT IN AFRICA

Credits: 3-0-3

Description: An examination of wars and conflicts in Africa from pre-colonial times to the present, with particular emphasis on the post-colonial period. Through a series of directed readings and class discussion, students examine the social, economic and political origins, nature, and consequences of violence in Africa, taking into consideration both structural and cultural factors. In addition, students learn how to situate conflicts in Africa in a global context, including the role of nations outside the continent, if any, in contributing towards both war and peace in Africa. The course will also explore, from an operational perspective, what African conflicts can teach us about the "doctrines" of insurgency, counter-insurgency, and other forms of warfare.

Offered:

Requisites: Coreq: HH216

Course: HH367

Title: TOPICS IN REGIONAL HISTORY

Credits: 3-0-3

Description: An open topics history course. Topics vary from semester to semester and include a wide variety of specialized themes or eras in non-Western history which are too unique or unusual to be integrated into the regular curriculum. Examples of topics include the History of the Mongols, and the Balkans.

Offered: Fall, Spring

Requisites: Prereq: None; Coreq: HH216.

Course: HH368

Title: THE VIETNAM WAR: A REGIONAL HISTORY

Credits: 3-0-3

Description: This course examines the principal events, personalities, and questions of the Vietnam War from many historical perspectives. The first is that of the northern and southern Vietnamese communist leadership. The second is that of the Americans embroiled in military, political, and social circumstances. And the third is that of the Southeast Asian people - civilians, soldiers, journalists, politicians, and novelists - who experienced the conflicts firsthand. These historical narratives provide an immediate and insightful account of how the war affected the United States and Southeast Asia in the 1960s, 1970s, and beyond.

Offered:

Requisites: Prereq: HH104 & HH216

Course: HH369

Title: HISTORY AND CULTURE OF IRAN

Credits: 3-0-3

Description: This course explores processes of change as well as broad continuities in Iranian history and culture that have shaped this nation from ancient times to the present day. The course will examine this development through six distinct eras: (1) the culture and history of Ancient Iran, (2) the impact of the rise of Islam on Iran, (3) the Safavid era, (4) the impact of Europe on Iran, (5) nationalism in early modern Iran, and (6) the Iranian Revolution and the Islamic Republic.

Offered: Fall 2022-2023

Requisites: Coreq: HH216

Course: HH370

Title: SAMURAI AND SOLDIER IN JAPANESE HISTORY

Credits: 3-0-3

Description: Samurai rank among the most widely recognized yet least understood figures in world history. Spanning more than 1,000 years from the rise of warrior power during Japan's Heian Period to the contemporary transformation of samurai into global pop culture icons, this course demystifies samurai and their successors (imperial Japanese servicemen) by examining materials drawn from successive eras of Japan's past. Studying historical developments as well as real and imagined warrior traditions in Japan will enable you to develop your ability to analyze the often contradictory roles ascribed to and assumed by warfighters. In the process, this course challenges you to answer a key question: where did Japan's "samurai values" go?

Offered:

Requisites: Coreq: HH216

Course: HH371

Title: HISTORY OF FILM 1895-1968

Credits: 2-2-3

Description: This course examines the history of film from the first showing of motion pictures projected on a screen by the Lumieres in France in 1895. It will consider the origins and development of the film industry in the United States and abroad, the development of film techniques, the growth of the studio and star system, the introduction of sound, and efforts to deal with the rise of television. It will consider films both as an entertainment product for an international market and a source of national

expression. Issues of censorship and control will, therefore, be a part of the course. (The arbitrary end date of 1968 is the introduction of the present film rating system in the United States.)

Offered: Fall, Spring

Requisites: Prereq: None.

Course: HH372

Title: THE GOLDEN AGE OF PIRACY

Credits: 3-0-3

Description: The Golden Age of Piracy explores the figure of the pirate from the sixteenth century to today. Students learn about the differences between the "mythical pirate" familiar to today's public and the "historical" pirate of the early-modern era, and determine how and why this "real" pirate has become distorted over time. Students also learn about contemporary piracy and the role of the US Navy in dealing with this growing problem. Students augment their knowledge of historiography and social scientific theory; work with early-modern primary source materials; engage in case-studies in asymmetric, irregular, and unconventional warfare; study the evolution of privateering and naval warfare; and refine their analytical skills.

Offered: Fall 2022-2023

Requisites: Prereq: None.

Course: HH373

Title: HISTORY OF CHRISTIANITY

Credits: 3-0-3

Description: This course examines the history of Christianity from its origins to the present. It will pay particular attention to problems of authority and text; to the development of doctrine and practice; and to the relationship between religious and political institutions. Because Christianity grew into a global religion with a variety of forms in practice, belief, and organization, this course will also pay close attention to the inculturation of Christianity -- that is, its adaption to and accommodation of various cultures -- as it spread and developed.

Offered: Fall

Requisites: Prereq: HH215.

Course: HH374

Title: MEDICINE & WAR SINCE 1850

Credits: 3-0-3

Description: War remakes human lives in diverse ways: as warfare evolves, so does the variety of its physical and mental consequences. This course explores historical ties between medicine and war from the mid nineteenth century until recent times, focusing on armed conflicts such as the U.S. Civil War, World War I, World War II, the Vietnam War, and the Afghanistan and Iraq wars. Course topics include the establishment of medico-military practices and facilities, the emergence of new medical treatments and technologies, and the expansion of social services for disabled veterans. Additionally, students will examine the modern-day historical experiences of not only battle casualties but also military caregivers such as medics, doctors, and nurses.

Offered:

Requisites: Prereq or Coreq: HH216

Course: HH375

Title: JAPAN AND THE SECOND WORLD WAR

Credits: 3-0-3

Description: Ever-escalating warfare gripped the Asia-Pacific region beginning with Japan's invasion of Manchuria in September 1931 until its surrender to Allied forces in August 1945. This course examines the history and legacy of Japan's long Second World War by focusing on how Japanese society experienced, interprets, and still engages with that conflict. As you trace the crisis from the heyday of prewar Japanese imperialism and through the postwar Allied occupation of Japan (1945-1952), you will study consequential events, ideas, and individuals that shaped Japan's war and determined its defeat. Then, you will turn your attention to controversies concerning how the war has been understood inside and outside of Japan during the postwar era.

Offered:

Requisites: Prereq or Coreq: HH216

Course: HH376

Title: HISTORY OF ENGINEERING

Credits: 3-0-3

Description: Examines the history of engineering since the medieval period. Topics will include the effects of national culture on engineering practice; the epistemology of engineering including case studies of engineering designs; the rise of science-influenced modern engineering; the creation of the engineering profession; the external factors that have shaped engineering and engineers; the changing nature of engineering education; engineering specialization and the practice of engineering; and the evolution of engineering culture.

Offered:

Requisites: Co-req: HH216

Course: HH377

Title: TOPICS IN THEMATIC HISTORY

Credits: 3-0-3

Description: An open topics history course. Topics vary from semester to semester and are often team-taught. A variety of historical themes dealing with long term developmental processes will be subjected to detailed analyses. Examples of topics include piracy, the development of national identities and the growth of capitalism.

Offered: Fall 2022-2023

Requisites: Prereq: None; Coreq: HH216.

Course: HH378

Title: HISTORY OF TECHNOLOGY IN PEACE AND WAR

Credits: 3-0-3

Description: Examines the social and historical implications of changing technology: how humans, their ideas, and the environment shaped and were in turn shaped by technological innovation. The course will devote approximately equal time to the study of civilian sector technologies and military technologies, beginning with the Middle Ages and concluding in the early 21st century. In addition, the course will review and develop student familiarity with competing theories of socio-technological change.

Offered: Fall

Requisites: Prereq: None Coreq: HH215 or HH216

Course: HH380

Title: HISTORY OF SCIENCE

Credits: 3-0-3

Description: History of Science provides a survey of the history of science from the early Greek natural philosophers through the advent of 20th century "big science", with emphasis on early modern science, including the 17th century scientific revolution, 18th century Enlightenment science, and the post-Enlightenment rise of the modern physical and natural sciences.

Offered: Spring

Requisites: Prereq: None; Coreq: HH216.

Course: HH382

Title: WARFARE IN THE AGE OF SAIL, 1500-1815

Credits: 3-0-3

Description: This course examines the theory, practice, and nature of warfare on sea and land, both in Europe and European colonies, from about 1500 through the era of Napoleon. Tactical, logistical, technological, and professional developments of Western navies and armies are studied in their political, economic, social, and cultural contexts. The course particularly explores the fundamental questions: What role did Western weapons and warfare, particularly warfare at sea, play in the development of Europe's various empires and Europe's eventual global dominance? Important topics include the rise of gunpowder weapons, the "Military Revolution," the rise of national armies and navies, maritime empires, and the lives of sailors and soldiers.

Offered: Fall

Requisites: Prereq: None; Coreq: HH216.

Course: HH383

Title: THE AGE OF TOTAL WAR, 1815-1945

Credits: 3-0-3

Description: Surveys the dimensions of warfare and civil-military relations from the end of the Napoleonic era through World War II.

Offered: Fall 2022-2023

Requisites: Prereq: None; Coreq: HH216.

Course: HH384

Title: RECENT MILITARY AND NAVAL HISTORY

Credits: 3-0-3

Description: Surveys the dimensions of warfare and civil-military relations from the end of the World War II to the present.

Offered: Spring

Requisites: Prereq: None; Coreq: HH216.

Course: HH385

Title: THE U.S. MARINE CORPS

Credits: 3-0-3

Description: The historical development of the U.S. Marine Corps is examined by tracing the evolution of its roles and missions, organization, capabilities, and institutional culture. Emphasis is placed on how the Marine Corps has perceived its role in American Society, and how it has been perceived by American society.

Offered: Spring

Requisites: Prereq: None; Coreq: HH216.

Course: HH387

Title: HISTORY OF AIR POWER

Credits: 3-0-3

Description: This course examines the military exploitation of the third dimension, and its consequent effects on warfare development in the twentieth century. The course will focus on air power technology and doctrine development globally over time and its impact on national policy and military strategy. The class will also examine how theory and doctrine were put into practice during war and will trace the rapid change in technology and its impact on air power into the 21st century.

Offered: Fall 2022-2023

Requisites: Prereq: HH216

Course: HH389

Title: HISTORY OF HINDUISM

Credits: 3-0-3

Description: This course introduces Midshipmen to a broader history of what we call 'Hinduism', but what Indians themselves call sanatana dharma (the timeless 'duty'/'order'). Gandhian non-violence has long cast a shadow over western understandings of Hinduism, and this course explores the early development of Hinduism 4,000 years ago and how notions of henotheism, ontology, dharma, karma and ritual have evolved over time. It emphasizes the tensions between renouncing/non-violence and householders/violence in daily life, and how debates about violence permeate the traditions that worship Shiva and Vishnu. The course ends by exploring how Hindu views of their identity have changed with India's encounter with Muslim and later British rule.

Offered:

Requisites: Coreq: HH216

Course: HH400A

Title: CAPSTONE: HISTORIOGRAPHY

Credits: 3-0-3

Description: Organized around a topic of the instructor's choice, this seminar course provides History Majors the chance to demonstrate and further hone their critical reading and analysis skills by examining the perspectives of multiple historians on the same subject and how these perspectives changed across time. Students will discuss and evaluate the methodological choices,

ideological goals, and interpretive outcomes of these historians. They will complete a total portfolio of 25 pages of writing, including a culminating 10-page final essay that advances an argument about one subfield of the topic based on primary and secondary sources.

Offered:

Requisites: Prereq: HH200 and HH300, and 1/C History Major.

Course: HH400B

Title: CAPSTONE: RESEARCH ESSAY

Credits: 3-0-3

Description: This course provides History Majors with the opportunity to demonstrate their knowledge and skills as a historian through the completion of a deeply researched, 25-page historical paper. In a seminar setting, students will ask and answer a relevant historical question on a topic of their choosing. In the process they will address related secondary literature, demonstrate appropriate methodology, and use primary source evidence effectively with the goal of contributing to historical knowledge.

Offered:

Requisites: Prereq: HH200 and HH300, and 1/C History Major.

Course: HH462

Title: SEMINAR IN ADVANCED STUDIES

Credits: 3-0-3

Description: Offers midshipmen with a solid base in historical studies an opportunity to pursue the discipline at a level of greater sophistication. Taught in small, intensive seminars; individual sections will engage in a detailed examination of a selected historical topic. Each section will focus on a particular event or problem in history and on the interpretative debates surrounding it.

Offered: Fall, Spring

Requisites: Prereq: 1/C HHS major or permission of department chair.

Course: HH508

Title: HONORS COLLOQUIUM

Credits: 3-2-4

Description: Students will propose, conceptualize, and refine their 1/C independent research projects. In the process, they will test different historical interpretations, and evaluate different philosophies of history. They will submit a series of short essays culminating in a precis specifying both the topic of their Honors research projects and the arguments these projects will advance.

Offered: Spring

Requisites: Prereq: HH507.

Course: HH509

Title: HONOR SENIOR THESIS

Credits: 3-2-4

Description: With the guidance of a faculty adviser, students prepare analytical research papers interpreting an historical topic of their choice. Each student makes an oral presentation of the finished paper before the faculty-student Honors Committee and external readers.

Offered: Fall 2022-2023

Requisites: Prereq: HH507, HH508.

Course: HH512

Title: HONORS THESIS READINGS

Credits: 2-0-2

Description: After selecting a research topic and advisor, history honors students will engage in intensive reading of primary and secondary works related to the topic.

Offered: Spring

Requisites: Prereq: HSHS major.

Languages and Cultures Department Courses (FA, FC, FF, FG, FJ, FL, FR, FS, FX)

Course: FA101

Title: 100-LEVEL ARABIC I

Credits: 3-0-3

Description: Students learn the rudiments of Arabic language proficiency, ending the semester with the ability to have short introductory conversations about self, family and work, and to read and write in Arabic script, and well-prepared to build their skills in the second semester. The majority of class time is conducted in Arabic. Students are supported with video and audio tapes, and significant written and oral work. We focus on the standard language used throughout the Arab World, with significant treatment of the issues of dialectical Arabic.

Offered: Fall 2022-2023

Requisites: Prereq: None.

Course: FA102

Title: 100-LEVEL ARABIC II

Credits: 3-0-3

Description: Students further develop their Arabic proficiency skills, broadening the range of topics with which they can deal in the language, and deepening their understanding of Arabic grammar and syntax. Students produce Arabic in both oral and written modes, while strengthening their listening and reading abilities. Students become familiar with more complex aspects of Arabic culture through the use of video and audio tapes, with an occasional internet assignment. Students develop the ability to use spoken and written Arabic for a growing set of tasks and situations.

Offered: Spring

Requisites: Prereq: FA101.

Course: FA121

Title: INTENSIVE 100-LEVEL ARABIC I

Credits: 3-0-3

Description: The intensive six-credit corequisites FA121 and FA123 are designed for novices to equip themselves with several basic life skills in Arabic to lay a foundation for higher level learning of the language. Students learn to offer and solicit information about themselves and others, about family structure and members, fields of work and study, educational and geographical life experience, their homes, hobbies, food culture and related activities, understand and offer basic directions, and discuss weather, seasons and climate. Cultural knowledge is integrated into instruction. The teacher assigns students activities to complete to show their language competence. FA121 and FA123 are roughly equivalent to FA101 and FA102.

Offered: Fall 2022-2023

Requisites: Co-req: FA123

Course: FA123

Title: INTENSIVE 100-LEVEL ARABIC II

Credits: 3-0-3

Description: The intensive six-credit corequisites FA121 and FA123 are designed for novices to equip themselves with several basic life skills in Arabic to lay a foundation for higher level learning of the language. Students learn to offer and solicit information about themselves and others, about family structure and members, fields of work and study, educational and geographical life experience, their homes, hobbies, food culture and related activities, understand and offer basic directions, and discuss weather, seasons and climate. Cultural knowledge is integrated into instruction. The teacher assigns students activities to complete to show their language competence. FA121 and FA123 are roughly equivalent to FA101 and FA102.

Offered: Fall 2022-2023

Requisites: Co-req: FA121

Course: FA201

Title: 200-LEVEL ARABIC I

Credits: 3-0-3

Description: Students continue to develop all their skills in Arabic, with longer, more diverse texts, more complex situations, and more challenging oral and written assignments. Students review, strengthen and refine their grasp of Arabic grammar and syntax, and develop vocabulary bases for an ever-broadening set of fields. Arabic broadcasts, films and authentic contemporary texts are used to supplement the textbook.

Offered: Fall 2022-2023

Requisites: Prereq: FA102.

Course: FA202

Title: 200-LEVEL ARABIC II

Credits: 3-0-3

Description: In this continuation of intermediate Arabic, students supplement their textbook work with a set of sample authentic texts and media from a variety of fields, allowing discussion and writing on more complex ideas, and giving students opportunity to improve all their language skills, and broaden their skill base. The semester culminates with a short written paper and student classroom presentations all delivered in Arabic.

Offered: Spring

Requisites: Prereq: FA201.

Course: FA220

Title: INTENSIVE 200-LEVEL ARABIC I

Credits: 3-0-3

Description: The six-credit-hour combined corequisites FA220 and FA222 are the continuation of the intensive sequence begun with FA121 and FA123. This course is designed to support students further acquisition of Arabic in all four skills, speaking, listening, reading and writing, and move into intermediate level language competency. Students will increase their knowledge of vocabulary, grammar and culture to allow them to use the language to communicate about daily and weekly schedules, planning for visits and travel, household chores, furnishings and arrangements, holidays and culturally specific customs, purchasing, dating and marriage, aspects of Arab cultural history, and Arab diaspora. The combined corequisite courses are equivalent to FA201 and FA202.

Offered:

Requisites: Pre-req: FA121/123 Co-req: FA222

Course: FA222

Title: INTENSIVE 200-LEVEL ARABIC II

Credits: 3-0-3

Description: The six-credit-hour combined corequisites FA220 and FA222 are the continuation of the intensive sequence begun with FA121 and FA123. This course is designed to support students further acquisition of Arabic in all four skills, speaking, listening, reading and writing, and move into intermediate level language competency. Students will increase their knowledge of vocabulary, grammar and culture to allow them to use the language to communicate about daily and weekly schedules, planning for visits and travel, household chores, furnishings and arrangements, holidays and culturally specific customs, purchasing, dating and marriage, aspects of Arab cultural history, and Arab diaspora. The combined corequisite courses are equivalent to FA201 and FA202.

Offered:

Requisites: Pre-req: FA121/123 Co-req: FA220

Course: FA301

Title: ADVANCED ARABIC I

Credits: 3-0-3

Description: Using a variety of texts and media, students will work toward greater fluency in spoken and written Arabic. The course, conducted entirely in Arabic, will include reading short stories, articles from the press, film and selections from the Arabic literary heritage. Students will conduct full classroom discussions, write essays and stories, and present results of research in class.

Offered:

Requisites: Prereq: Validation of FA202 or a grade of B or higher in FA202 or approval of department chair.

Course: FA302

Title: ADVANCED ARABIC II

Credits: 3-0-3

Description: Using exclusively Arabic in the classroom, the students will work toward greater fluency in spoken and written Arabic. The course will include the reading and discussion of a short novel or a piece of Arabic drama, with discussion of pertinent cultural, historical and political dimensions. The course will emphasize growth in grammatical and stylistic sophistication.

Offered:

Requisites: Prereq: FA301.

Course: FA309

Title: LANGUAGE IMMERSION ABROAD-ARABIC

Credits: 3-0-3

Description: This LSAP immersion course entails language and culture immersion through classroom and experiential learning in the context of an academic program in the specific host country vetted by the appropriate USNA faculty in the Languages and Cultures Department. Each LSAP program is designed to facilitate development of a midshipman's language skills and to promote their understanding of social, cultural and historical aspects of the target country. Every LSAP program is designed with a minimum of 45 contact hours of language instruction in addition to 15 hours of cultural learning and excursions in the host country. FA309 offers three credits to students who successfully complete a four week LSAP program abroad with a passing grade. In order to receive credit and appropriate placement, students must complete the Languages and Cultures Department program assessment as specified by the program manager at a level of C or above to receive three validation credits, and to be placed into the appropriate level of the USNA language program in order to continue language gains in the classroom upon return. FA309 will reflect credits earned during LSAP, if and only if the experience of the language immersion abroad CANNOT be mapped onto an existing language course at USNA.

Offered:

Requisites: Prereq: FA202 or equivalent

Course: FA315

Title: CONVERSATION & COMPOSITION IN ARABIC

Credits: 3-0-3

Description: This course emphasizes development of oral and reading and writing proficiency towards advanced level, with special attention on grammar, syntax, vocabulary, speaking and writing. Text selection and supplementary audiovisual materials encourage the development of the skills to read and discuss in Arabic, and then to write increasingly complex short essays and argument structures, practicing stylistic devices and different types of complex discourse connectors. Students will also be taking increasing responsibility to run their class time in Arabic through presentations and guided discussions.

Offered: Fall 2022-2023

Requisites: Pre-req: FA202 or FA220/222 or equivalent.

Course: FA321

Title: 300-LEVEL ARABIC I

Credits: 3-0-3

Description: Using a variety of texts and media, students will work toward greater fluency in spoken and written Arabic. The course, conducted entirely in Arabic, will include reading short stories, articles from the press, film and selections from the Arabic literary heritage. Students will conduct full classroom discussions, write essays and stories, and present results of research in class.

Offered: Fall 2022-2023

Requisites: Prereq: FA202 or FA220/222 or approval of department chair.

Course: FA322

Title: 300-LEVEL ARABIC II

Credits: 3-0-3

Description: Using exclusively Arabic in the classroom, the students will work toward greater fluency in spoken and written Arabic. The course will include the reading and discussion of a short novel or a piece of Arabic drama, with discussion of pertinent cultural, historical and political dimensions. The course will emphasize growth in grammatical and stylistic sophistication.

Offered:

Requisites: Prereq: FA301.

Course: FA325

Title: MEDIA ARABIC

Credits: 3-0-3

Description: This course familiarizes advanced students of Arabic with various forms of popular media, including Arabic newspapers and magazines, television news, internet sites, and radio broadcasts. Students write a series of short essays on topical societal issues using the vocabulary and syntactical structures practiced in class.

Offered: Fall 2022-2023

Requisites: Prereq: FA202 and approval of department chair.

Course: FA342

Title: ARABIC DIALECT

Credits: 3-0-3

Description: This course familiarizes students of Arabic with one of the major dialects of Arabic spoken in the Arab world. Students learn the basics of speaking in the dialect, as well as sounds, forms, idiomatic vocabulary, and grammatical structures which characterize it. Possible dialects: Syrian (FA342S), Egyptian (FA342G), Palestinian (FA342P), Moroccan (FA342M), Omani (FA342O), Lebanese (FA342L), or others as set by the Arabic faculty. Can be repeated for a different dialect.

Offered: Spring

Requisites: Prereq: FA202 and approval of department chair.

Course: FA350E

Title: WINDOW ON ARABIC CULTURE

Credits: 3-0-3

Description: Using English translations, this course explores Arab culture from the Qur'an to current novels and films. Class discusses Arab identities, intellectual contributions of Arabs, and Arab voices on key issues today. Counts as an upper level Humanities-Social Science course. (Taught in English)

Offered: Fall 2022-2023

Requisites: Prereq: HE112 or equivalent.

Course: FA425

Title: ARABIC DISCOURSE IN SOCIETY

Credits: 3-0-3

Description: This advanced language course aims to acquaint students with various types of complex Arabic discourse, illustrating aspects of Arabic cultural history, modern Arab societies and cultural movements. Text selections and supplementary audiovisual materials relate to modern and historical political thought, religious thought, cultural criticism, historical investigation, philosophy and literature. Students read and discuss selections in Arabic, analyzing the texts' complex syntactical structures, and evaluating stylistic and rhetorical devices. Writing assignments focus on improving students' composing style, content, and argument structure.

Offered: Fall 2022-2023

Requisites: Prereq: FA202 and approval of department chair.

Course: FA426

Title: MODERN ARABIC LITERATURE

Credits: 3-0-3

Description: This course, conducted completely in Arabic, explores samples of highly acclaimed modern Arabic literature from throughout the Arab world. Students read and analyze works by authors from a broad geographical area extending from Morocco to the Arabic Gulf, and extending in time from 1900 to the present day. Recurring themes in modern and contemporary literature, such as cultural and national identity, colonialism, religion, gender relations, and class conflict, are the bases of discussion of the texts and related writing assignments in Arabic. The course entails reading of short stories, a novella or chapters from a longer novel, and poetry.

Offered: Spring

Requisites: Prereq: FA301 and FA302, or approval of department chair.

Course: FC101

Title: 100-LEVEL CHINESE I

Credits: 3-0-3

Description: The first of a two-course sequence using an integrated approach to develop the learner's ability to understand, speak, read and write Standard Mandarin Chinese. Communicative skills are developed through various activities in and out of class. Romanized spelling and square characters are taught, as well as pronunciation, sentence structure, and basic vocabulary. Cultural exposure accompanies the development of communicative skills. If taken and passed at USNA, may be used as a free elective by Division I and II majors.

Offered: Fall 2022-2023

Requisites: Prereq: None.

Course: FC102

Title: 100-LEVEL CHINESE II

Credits: 3-0-3

Description: A continuation of FC101. If taken and passed, may be used in place of a 200 level humanities-social science elective in Division I and II majors.

Offered: Spring

Requisites: Prereq: FC101.

Course: FC121

Title: INTENSIVE 100-LEVEL CHINESE I

Credits: 3-0-3

Description: The intensive six-credit corequisites FC121 and FC123 are designed for novices to equip themselves with some basic life skills in Mandarin Chinese to lay a foundation for higher level learning of the language. The two-course sequence uses an integrated approach to develop students' ability to understand, speak, read, and write Standard Mandarin Chinese about daily routines. Communicative skills are developed through various activities in and out of class. Romanized spelling and square characters are taught, as well as pronunciation, sentence structure, and basic vocabulary. Cultural exposure accompanies the development of communicative skills. If taken and passed at USNA, the course may be used as a free elective by Division I and II majors. FC121 and FC123 are equivalent to FC101 and FC102.

Offered: Fall 2022-2023

Requisites: Co-req: FC123 or permission of the Dept Chair.

Course: FC123

Title: INTENSIVE 100-LEVEL CHINESE II

Credits: 3-0-3

Description: The intensive six-credit corequisites FC121 and FC123 are designed for novices to equip themselves with some basic life skills in Mandarin Chinese to lay a foundation for higher level learning of the language. The two-course sequence uses an integrated approach to develop students' ability to understand, speak, read, and write Standard Mandarin Chinese about daily routines. Communicative skills are developed through various activities in and out of class. Romanized spelling and square characters are taught, as well as pronunciation, sentence structure, and basic vocabulary. Cultural exposure accompanies the development of communicative skills. If taken and passed at USNA, the course may be used as a free elective by Division I and II majors. FC121 and FC123 are equivalent to FC101 and FC102.

Offered: Fall 2022-2023

Requisites: Co-req: FC121 or permission of the Dept Chair.

Course: FC201

Title: 200-LEVEL CHINESE I

Credits: 3-0-3

Description: This course continues from the two Basic Chinese courses and provides further training of the learner's all-round ability to understand, speak, read and write Standard Mandarin. While emphasis is still placed on communicative skills, the learners are expected to extend their vocabulary and grammatical knowledge to a more comprehensive level, to the extent that they could readily and appropriately apply this knowledge to the expression of their own ideas as well as the understanding of more native-style oral and written texts. More cultural exposure is involved to facilitate appropriate communication, and more characters are taught to consolidate reading and writing.

Offered: Fall 2022-2023

Requisites: Prereq: FC102.

Course: FC202

Title: 200-LEVEL CHINESE II

Credits: 3-0-3

Description: A continuation of Second-Year Chinese I (FC201).

Offered: Spring

Requisites: Prereq: FC201.

Course: FC220

Title: INTENSIVE 200-LEVEL CHINESE I

Credits: 3-0-3

Description: The six-credit-hour combined corequisites FC220 and FC222 are the continuation of the intensive sequence begun with FC121 and FC123. Communicative skills are developed through various activities in and out of class. Romanized spelling and square characters are taught, as well as pronunciations, sentence structures, and basic vocabulary. Cultural exposure accompanies the development of communicative skills. If taken and passed at USNA, the course may be used as a free elective by Division I and II majors. The combined corequisite courses are equivalent to FC201 and FC202.

Offered:

Requisites: Co-req: FC222 or permission of the Dept Chair.

Course: FC222

Title: INTENSIVE 200-LEVEL CHINESE II

Credits: 3-0-3

Description: The six-credit-hour combined corequisites FC220 and FC222 are the continuation of the intensive sequence begun with FC121 and FC123. Communicative skills are developed through various activities in and out of class. Romanized spelling and square characters are taught, as well as pronunciations, sentence structures, and basic vocabulary. Cultural exposure accompanies the development of communicative skills. If taken and passed at USNA, the course may be used as a free elective by Division I and II majors. The combined corequisite courses are equivalent to FC201 and FC202.

Offered:

Requisites: Co-req: FC220 or permission of the Dept Chair.

Course: FC301

Title: 300-LEVEL CHINESE I

Credits: 3-0-3

Description: The first of a two course sequence which transitions from controlled training in language skills to freer and more authentic communications in Mandarin Chinese. Class activities are purposefully organized and strictly guided. A larger amount of cultural content is loaded in various problem-solving tasks. Character reading and writing are enhanced by the use of dictionaries and by computer input of the Romanized Pinyin system. Daily practice of handwriting and memorization of more characters.

Offered: Fall 2022-2023

Requisites: Prereq: FC202.

Course: FC302

Title: 300-LEVEL CHINESE II

Credits: 3-0-3

Description: A continuation of Third-Year Chinese I. See FC301 for a listing of topics.

Offered: Spring

Requisites: Prereq: FC301.

Course: FC309

Title: LANGUAGE IMMERSION ABROAD-CHINESE

Credits: 3-0-3

Description: This LSAP immersion course entails language and culture immersion through classroom and experiential learning in the context of an academic program in the specific host country vetted by the appropriate USNA faculty in the Languages and Cultures Department. Each LSAP program is designed to facilitate development of midshipman language skills and to promote their understanding of social, cultural and historical aspects of the target country. Every LSAP program is designed with a minimum of 45 contact hours of language instruction in addition to 15 hours of cultural learning and excursions in the host country. FC309 offers three credits to students who successfully complete a four week LSAP program abroad with a passing grade. In order to receive credit and appropriate placement, students must complete the Languages and Cultures Department program assessment as specified by the program manager at a level of C or above to receive three validation credits, and to be placed into the appropriate level of the USNA language program in order to continue language gains in the classroom upon return. FC309 will reflect credits earned during LSAP, if and only if the experience of the language immersion abroad CANNOT be mapped onto an existing language course at USNA.

Offered:

Requisites: Prereq: FC202 or equivalent

Course: FC350

Title: CHINESE CULTURE THROUGH FILM

Credits: 3-0-3

Description: This course, taught in English, offers an introduction to Chinese society and culture through feature films, documentaries, and readings. Each film is studied from various theoretical and analytical perspectives. Topics include Chinese historical events, aspects of Chinese culture and society, relationship between tradition and modernity, gender politics, and Chinese nationalism in the era of globalization. The course is one of Hum/SS electives and part of the Regional Studies courses at USNA. Knowledge of Chinese language is not required. Films have English subtitles.

Offered: Fall

Requisites: Prereq: HE111 or equivalent.

Course: FC360

Title: 20TH-CENTURY CHINESE LIT

Credits: 3-0-3

Description: This course, taught in English, offers a study of modern Chinese identity through literature. The course materials include short stories, plays, poems, and novels by Chinese writers, as well as historical narratives, biographies, and literary criticism by Western scholars. The objectives of the course are to understand history, society and culture of 20th-century China; to learn different critical methods and strategies for analyzing and finding value in literary texts; to understand the concept of the self in traditional and modern Chinese thought, and the relationship between the individual self and Chinese national identity. The course is one of Hum/SS electives. Knowledge of Chinese is not required.

Offered: Fall 2022-2023

Requisites: Prereq: HE112 or equivalent.

Course: FC401

Title: CHINESE LANGUAGE & CULTURE I

Credits: 3-0-3

Description: This course continues from FC302 to further enhance midshipmen's exposure to Chinese vocabulary, grammar, discourse structure, communicative skills, character reading and writing, as well as their knowledge of Chinese culture. Through a rich variety of topics such as the origin and structure of Chinese characters, homophones and idioms, traditional and simplified characters, the origin of the name of the country, women and marriage, education, birth-control, human rights, religion, myths, and folk tales, midshipmen increase their understanding of China's history and modern life, while gradually moving to comparatively higher levels of proficiency in spoken and written Chinese.

Offered: Fall 2022-2023

Requisites: Prereq: FC302 or equivalent.

Course: FC402

Title: CHINESE LANGUAGE & CULTURE II

Credits: 3-0-3

Description: This course continues from FC401 to further enhance midshipmen's exposure to Chinese vocabulary, grammar, discourse structure, communicative skills, character reading and writing, as well as their knowledge of Chinese culture. Through a rich variety of topics such as the origin and structure of Chinese characters, homophones and idioms, traditional and simplified characters, the origin of the name of the country, women and marriage, education, birth-control, human rights, religion, myths, and folk tales, midshipmen increase their understanding of China's history and modern life, while gradually moving to comparatively higher levels of proficiency in spoken and written Chinese.

Offered: Spring

Requisites: Prereq: FC401 or equivalent.

Course: FC403

Title: CHINESE LANGUAGE & CULTURE III

Credits: 3-0-3

Description: FC403 continues from FC402 to further increase midshipmen's exposure to Chinese vocabulary, grammar, and discourse structure. The course further develops midshipmen's speaking and character recognition skills, as well as knowledge of Chinese culture. Through a rich variety of topics including the origin and structure of Chinese characters, pragmatics, language policies, national identity, and women and marriage, midshipmen gradually move to a more advanced level both in their ability to use Chinese and in their readiness to deal with various cross-linguistic and cross-cultural tasks.

Offered: Fall

Requisites: Prereq: FC402 or equivalent level by validation.

Course: FC404

Title: CHINESE LANGUAGE & CULTURE IV

Credits: 3-0-3

Description: FC404 continues from FC403 to further develop midshipmen's ability in listening, speaking, reading, and writing, and their understanding of Chinese culture. Through a rich variety of topics such as education, population policy, human rights, religion and popular culture, midshipmen gradually move to a more advanced level both in their ability to use the target language and in their readiness to deal with various cross-linguistic and cross-cultural communication tasks.

Offered: Spring

Requisites: Prereq: FC403 or equivalent level by validation.

Course: FC411

Title: ADVANCED READING & WRITING I

Credits: 3-0-3

Description: FC411 focuses on transitioning from oral communication about daily routines to reading and writing formal Chinese with sophisticated content and complex sentence structure. Midshipmen learn advanced vocabulary and strategies for more challenging material and engage in regular classroom discussion and composition writing in Chinese based on their reading assignments to enhance their reading and writing skills.

Offered: Fall

Requisites: Prereq: FC404 or equivalent level by validation.

Course: FC412

Title: ADVANCED READING & WRITING II

Credits: 3-0-3

Description: FC412 continues from FC411 with the same focus on advanced reading and writing in formal Chinese. The course further enhances midshipmen's ability to process formal written materials with complex structure and more sophisticated

ideas. Through reading and writing assignments, the course also prepares midshipmen for communicative tasks in various socio-cultural settings, with an emphasis on both linguistic and stylistic characteristics of formal Chinese.

Offered: Spring

Requisites: Prereq: FC411 or equivalent level by validation.

Course: FC413

Title: ADVANCED READING & WRITING IN CHINESE III

Credits: 3-0-3

Description: FC413, Advanced Reading and Writing in Chinese 3 continues FC412 at the advanced level with the same focus on reading and writing formal Chinese. The course further enhances midshipmen's ability to process formal written materials with complex structure and more refined and sophisticated ideas. Through reading and writing assignments, the course also prepares midshipmen for communicative tasks in various socio-cultural contexts of the target language.

Offered: Fall 2022-2023

Requisites: Prereq: FC412 or validation.

Course: FC414

Title: ADVANCED READING & WRITING IN CHINESE IV

Credits: 3-0-3

Description: FC414, Advanced Reading and Writing in Chinese 4 continues FC413 at the advanced level with the same focus on reading and writing formal Chinese. The course further enhances midshipmen's ability to process formal written materials with more complex structure and refined sophisticated ideas. Through reading and writing assignments, the course also prepares midshipmen for communicative tasks in various socio-cultural contexts of the target language with an emphasis on both linguistic and stylistic characteristics of formal Chinese.

Offered:

Requisites: Prereq: FC413 or validation.

Course: FC450

Title: STYLES OF DISCOURSE IN CHINESE

Credits: 3-0-3

Description: This course consolidates knowledge and skills students have acquired through previous Chinese courses. It enhances their reading, writing, and aural-oral abilities through studies of different styles of discourse such as stories, advertisements, public notices, public speeches, letters, and interviews. Building on comprehension and expression at the level of single sentences, emphasis is placed on various discourse organization mechanisms such as narratives with sequential or cause-effect arrangements, descriptions of physical environments and personal emotions, and arguments of positions and opinions in different contexts.

Offered: Fall 2022-2023

Requisites: Prereq: FC302 or equivalent.

Course: FC460

Title: CHINESE IN MEDIA

Credits: 3-0-3

Description: This course develops students' Chinese proficiency at a more advanced level, through work with various forms of Chinese media, including newspaper reports, internet news, TV excerpts and other audio-visual materials. Students expand their vocabulary, enrich their knowledge of grammatical structures and idiomatic expressions, gain greater exposure to written-style Chinese, and increase their comprehension and production of narration, description, and argumentation in both speaking and writing.

Offered: Spring

Requisites: Prereq: FC401 or FC450 or equivalent.

Course: FF101

Title: BASIC FRENCH I

Credits: 3-0-3

Description: Develops basic communicative skills, with an emphasis on speaking and listening comprehension.
Offered: Fall 2022-2023
Requisites: Prereq: None.

Course: FF102

Title: BASIC FRENCH II

Credits: 3-0-3

Description: Develops basic communicative skills, with an emphasis on speaking and listening comprehension.

Offered: Spring

Requisites: Prereq: FF101.

Course: FF201

Title: INTERMEDIATE FRENCH I

Credits: 3-0-3

Description: Continues development of oral, reading, and writing skills using real-life situations. Emphasizes practical, everyday culture of the French-speaking world.

Offered: Fall 2022-2023

Requisites: Prereq: FF102.

Course: FF202

Title: INTERMEDIATE FRENCH II

Credits: 3-0-3

Description: Continues development of oral, reading, and writing skills using real-life situations. Emphasizes practical, everyday culture of the French-speaking world.

Offered: Spring

Requisites: Prereq: FF201.

Course: FF301

Title: ADVANCED FRENCH WITH CIVILIZATION READINGS I

Credits: 3-0-3

Description: Develops fluency in conversation and facility in reading and writing. Topics emphasize main aspects of Francophone Literatures and Cultures. Taught in French.

Offered: Fall 2022-2023

Requisites: Prereq: FF202.

Course: FF302

Title: ADVANCED FRENCH WITH CIVILIZATION READINGS II

Credits: 3-0-3

Description: Develops fluency in conversation and facility in reading and writing. Topics emphasize main aspects of Francophone Literatures and Cultures. Taught in French.

Offered: Spring

Requisites: Prereq: FF202.

Course: FF309

Title: LANGUAGE IMMERSION ABROAD-FRENCH

Credits: 3-0-3

Description: This LSAP immersion course entails language and culture immersion through classroom and experiential learning in the context of an academic program in the specific host country vetted by the appropriate USNA faculty in the Languages and Cultures Department. Each LSAP program is designed to facilitate development of midshipman language skills and to promote their understanding of social, cultural and historical aspects of the target country. Every LSAP program is designed with a minimum of 45 contact hours of language instruction in addition to 15 hours of cultural learning and excursions in the host country. FF309 offers three credits to students who successfully complete a four week LSAP program abroad with a passing grade.

In order to receive credit and appropriate placement, students must complete the Languages and Cultures Department program assessment as specified by the program manager at a level of C or above to receive three validation credits, and to be placed into the appropriate level of the USNA language program in order to continue language gains in the classroom upon return. FF309 will reflect credits earned during LSAP, if and only if the experience of the language immersion abroad CANNOT be mapped onto an existing language course at USNA.

Offered:

Requisites: Prereq: FF202 or equivalent

Course: FF411

Title: DEVELOPMENT OF FRENCH CIVILIZATION

Credits: 3-0-3

Description: From the origins to World War II.

Offered: Fall

Requisites: Prereq: FF302 or approval of department chair.

Course: FF412

Title: MODERN FRANCE

Credits: 3-0-3

Description: All aspects of contemporary France: geography, economy, institutions, society, politics and culture.

Offered: Spring

Requisites: Prereq: FF302 or approval of department chair.

Course: FF421

Title: REPRESENTATIVE READINGS IN FRENCH LITERATURE I

Credits: 3-0-3

Description: Class discussions of works by leading writers of various periods. Program includes film versions of several titles. Taught in French.

Offered: Fall

Requisites: Prereq: FF302 or approval of department chair.

Course: FF422

Title: REPRESENTATIVE READINGS IN FRENCH LITERATURE II

Credits: 3-0-3

Description: Class discussions of works by leading writers of various periods. Program includes film versions of several titles. Taught in French.

Offered: Spring

Requisites: Prereq: FF302 or approval of department chair.

Course: FF432

Title: FRANCE AND THE ARAB WORLD

Credits: 3-0-3

Description: France and the Arab World engages midshipmen in reading, writing, and discussion about France's ties to the Arab world, including colonization and post-colonial political and cultural connections to North Africa and the Middle East.

Topics include French immigration policy and North African communities within France, Francophone literature of the Arab world, and the role of spoken and written French in North Africa and Lebanon. Materials include the articles from the Francophone press, fictional narratives, first person memoirs, documentaries, and feature films. Guest speakers in the classroom offer additional insider views and first hand experience of Francophone Arab countries. Conducted entirely in French.

Offered: Spring

Requisites: Prereq: FF302 or approval of department chair.

Course: FG101

Title: FIRST-YEAR GERMAN I

Credits: 3-0-3

Description: The 100-level German course sequence aims to take students with little to no knowledge of the German language and introduce and develop their speaking, reading, writing and listening comprehension and advance their cultural knowledge. In FG101 German students will advance through the beginner level. The course includes projects that are educational and engaging. Classroom activities are focused on student interaction and active, verbal participation. The goals are to develop the building blocks necessary in order to express oneself confidently and coherently in personal, familial, social and daily situations, and to acquaint students with aspects of German society and culture.

Offered: Fall 2022-2023

Requisites:

Course: FG102

Title: FIRST-YEAR GERMAN II

Credits: 3-0-3

Description: The 100-level German course sequence aims to take students with little to no knowledge of the German language and introduce and develop their speaking, reading, writing and listening comprehension and advance their cultural knowledge. At the 102 level, German students will expand their ability to communicate on personal topics. The course includes projects that are educational and engaging. Classroom activities are focused on student interaction and active, verbal participation. The goals are to develop the building blocks necessary in order to express oneself confidently and coherently in personal, familial, social and daily situations, and to acquaint students with aspects of German society and culture.

Offered:

Requisites: Prereq: FG101

Course: FG201

Title: SECOND-YEAR GERMAN I

Credits: 3-0-3

Description: The 200-level German course sequence aims to expand on students' abilities to speak, read, write, and listen and develop their cultural knowledge. All instructions and activities are performed in German to the maximum extent practicable. Classroom activities are focused on student interaction and active, verbal participation. This course has as its overarching goal the development of the student's proficiency. Additionally, this course builds on grammar and vocabulary developed in FG101/102 in order to express oneself confidently and coherently in personal, familial, social and daily situations, and acquaints students with aspects of German society and culture.

Offered: Fall 2022-2023

Requisites: Prereq: FG102

Course: FG202

Title: SECOND-YEAR GERMAN II

Credits: 3-0-3

Description: The 200-level German course sequence aims to expand on students' abilities to speak, read, write, and listen and develop their cultural knowledge. FG202 is a continuation of FG201. All instructions and activities are performed in German to the maximum extent practicable. Classroom activities are focused on student interaction and active, verbal participation. Additionally, this course builds on grammar and vocabulary developed in FG201 in order to express oneself confidently and coherently in personal, familial, social and daily situations, and acquaints students with aspects of German society and culture.

Offered:

Requisites: Prereq: FG201

Course: FG309

Title: LANGUAGE IMMERSION ABROAD – GERMAN

Credits: 3-0-3

Description: This LSAP immersion course entails language and culture immersion through classroom and experiential learning in the context of an academic program in the specific host country vetted by the appropriate USNA faculty in the Languages and Cultures Department. Each LSAP program is designed to facilitate development of midshipmen's language skills and to promote their understanding of social, cultural and historical aspects of the target country. Every LSAP program is designed

with a minimum of 45 contact hours of language instruction in addition to 15 hours of cultural learning and excursions in the host country. FG309 offers three credits to students who successfully complete a four week LSAP program abroad with a passing grade. In order to receive credit and appropriate placement, students must complete the Languages and Cultures Department's program assessment as specified by the program manager at a level of C or above to receive three validation credits, and to be placed into the appropriate level of the USNA language program in order to continue language gains in the classroom upon return. FG309 will reflect credits earned during LSAP, if and only if the experience of the language immersion abroad CANNOT be mapped onto an existing language course at USNA.

Offered:

Requisites: Prereq: FG202 or equivalent

Course: FG310

Title: CONTEMPORARY GERMANY - SPEAKING

Credits: 3-0-3

Description: This course advances midshipmen's German reading, writing and conversational skills by focusing on cultural topics in contemporary Germany (1945-), allowing them to increase their ability to successfully communicate in German while increasing their understanding and appreciation of German culture today. A special focus of this class is the advancement of midshipmen's listening and speaking abilities.

Offered: Fall 2022-2023

Requisites: Prereq: FG202

Course: FG320

Title: CONTEMPORARY GERMANY - WRITING

Credits: 3-0-3

Description: This course advances midshipmen's German reading, writing and conversational skills by focusing on cultural topics in contemporary Germany (1945-), allowing them to increase their ability to successfully communicate in German while increasing their understanding and appreciation of German culture today. A special focus of this class is the advancement of midshipmen's reading and writing abilities.

Offered:

Requisites: Prereq: FG310

Course: FG411

Title: GERMAN CULTURE - LITERATURE & ARTS I

Credits: 3-0-3

Description: This course, conducted entirely in German, advances midshipmen's German reading, writing and conversational skills by focusing on German culture through literature and the arts from the 18th century to the 20th century. This is a seminar style course which uses discussion, reading and writing, to expand midshipmen's German language skills beyond intermediate and help them explore works by writers such as Goethe and Schiller, composers such as J. S. Bach, Mozart and Beethoven, and artists such as C.D. Friedrich and Wilhelm Busch.

Offered:

Requisites: Prereq: FG320 or permission of the Dept. Chair.

Course: FG412

Title: GERMAN CULTURE - LITERATURE & ARTS II

Credits: 3-0-3

Description: This course, conducted entirely in German, is a continuation of FG411, developing midshipmen's knowledge of German literature, art and the media in contemporary Germany as well as continuing the development of their communication skills. Students begin the semester with the study of Weimar culture through literature and film, and end with explorations of contemporary German literature, art, music and forms of public and social media.

Offered:

Requisites: Prereq: FG411 or permission of the Dept Chair.

Course: FG421

Title: GERMAN CULTURE THROUGH FILM: 20TH CENTURY

Credits: 3-0-3

Description: This course, conducted entirely in German, explores German culture and history as it is expressed through German films from the 1930's - 1990's. By tracing the political and historical trajectory from the postwar era of reconstruction to the cold war to German unification, we will study a divided and reunited screen-scape in order to critically reflect on concepts of German nationality, cultural identity, and the politics of representation.

Offered:

Requisites: Prereq: FG320 or permission of the Dept Chair.

Course: FG422

Title: GERMAN CULTURE THROUGH FILM: 21ST CENTURY

Credits: 3-0-3

Description: This course, conducted entirely in German, focuses on German media and film-making since unification. We investigate how German media and cinema captured the atmosphere of the immediate post- unification years and discuss extensively major works of cinema since the 1990s. We will look at examples of Germany's film production and forms of social media to observe and comment on the roads German media has taken from the 1990's to the present in order to reflect on contemporary German culture and society.

Offered:

Requisites: Prereq: FG320 or permission of the Dept. Chair.

Course: FJ101

Title: FIRST-YEAR JAPANESE I

Credits: 3-0-3

Description: First-Year Japanese I introduces contemporary spoken and written Japanese. Emphasis is on developing basic communication skills in listening, speaking, reading and writings. All Kana letters and some Kanji characters are introduced.

Offered: Fall 2022-2023

Requisites: Prereq: None.

Course: FJ102

Title: FIRST-YEAR JAPANESE II

Credits: 3-0-3

Description: First-Year Japanese II continues to introduce students to contemporary spoken and written Japanese. Emphasis is on developing basic communication skills in listening, speaking, reading and writings. All Kana letters and some Kanji characters are introduced.

Offered: Spring

Requisites: Prereq: FJ101.

Course: FJ201

Title: SECOND-YEAR JAPANESE I

Credits: 3-0-3

Description: Second-Year Japanese I aims at further development of communication skills in spoken and written Japanese. More Kanji characters are introduced to prepare students to read authentic written materials such as memos, advertisements, and letters.

Offered: Fall 2022-2023

Requisites: Prereq: FJ102.

Course: FJ202

Title: SECOND-YEAR JAPANESE II

Credits: 3-0-3

Description: Second-Year Japanese II continues development of communication skills in spoken and written Japanese. Instructions and course materials are presented in Japanese.

Offered: Spring

Requisites: Prereq: FJ201.

Course: FJ261

Title: KANJI LOOK AND LEARN I

Credits: 1-0-0

Description: This noncredit course is designed for midshipmen who have a special interest in expanding their knowledge of Kanji (Chinese characters). In this course, about 160 Kanji and associated compound words are introduced by the frequency of their occurrence in the Japanese newspaper. Upon completion of this course, midshipmen will receive a letter grade that does not count toward cumulative QPRs.

Offered:

Requisites: Prereq: FJ101. Coreq: FJ102-FJ302.

Course: FJ271

Title: KANJI LOOK AND LEARN II

Credits: 1-0-0

Description: A direct continuation of FJ261: Kanji Look and Learn I. This noncredit course aims to build on the foundation of kanji and associated compound words that midshipmen have previously mastered. In this course, a second set of 160 kanji and associated compound words are introduced by the frequency of their occurrence in the newspapers. Upon completion of this course, midshipmen will receive a letter grade that does not count toward cumulative QPRs.

Offered:

Requisites: Prereq: FJ261. Coreq: FJ201-FJ301.

Course: FJ301

Title: THIRD-YEAR JAPANESE I

Credits: 3-0-3

Description: Third-Year Japanese I introduces more sophisticated vocabulary and more complex sentence structures required for effective interpersonal communication and interpretation of written texts.

Offered: Fall 2022-2023

Requisites: Prereq: FJ202.

Course: FJ302

Title: THIRD-YEAR JAPANESE II

Credits: 3-0-3

Description: Third-Year Japanese II aims at further development of communication skills. Emphasis is on inculcating knowledge of and sensitivity to the cultural and social context of the language use.

Offered: Spring

Requisites: Prereq: FJ301.

Course: FJ309

Title: LANGUAGE IMMERSION ABROAD – JAPANESE

Credits: 3-0-3

Description: This LSAP immersion course entails language and culture immersion through classroom and experiential learning in the context of an academic program in the specific host country vetted by the appropriate USNA faculty in the Languages and Cultures Department. Each LSAP program is designed to facilitate development of midshipmen's language skills and to promote their understanding of social, cultural and historical aspects of the target country. Every LSAP program is designed with a minimum of 45 contact hours of language instruction in addition to 15 hours of cultural learning and excursions in the host country. FJ309 offers three credits to students who successfully complete a four week LSAP program abroad with a passing grade. In order to receive credit and appropriate placement, students must complete the Languages and Cultures Department program assessment as specified by the program manager at a level of C or above to receive three validation credits, and to be placed into the appropriate level of the USNA language program in order to continue language gains in the classroom upon return. FJ309 will reflect credits earned during LSAP, if and only if the experience of the language immersion abroad CANNOT be mapped onto an existing language course at USNA.

Offered:

Requisites: Prereq: FJ202 or equivalent

Course: FJ310

Title: WINDOWS INTO JAPANESE CULTURE THROUGH FILM

Credits: 3-0-3

Description: This course explores traditional and contemporary Japanese culture through film. This course focuses on intercultural communication (verbal and non-verbal) and explores cultural differences found within Japanese films. A variety of films are explored including films depicting the era of the samurai, World War II and modern Japan. Discussions will highlight cultural patterns that distinguish Japan from the United States. Course readings focus on linguistic, social, and cultural information pertinent to specific periods in the history of Japan. This course will be offered in English.

Offered:

Requisites:

Course: FJ350

Title: JAPANESE CULTURE THROUGH FILM

Credits: 3-0-3

Description: This course explores Japanese culture through films. A major goal of the course is increasing students' knowledge and understanding of Japanese culture. We will explore various cultural topics, including lifestyles (housing, food), social structure (class, occupation), cultural practices (customs, communication styles), and cultural perspectives (values, norms). Midshipmen will also examine their thoughts, feelings, and attitudes toward Japanese culture to uncover perceptions in cultural differences. FJ350 is taught in Japanese.

Offered:

Requisites: Prereq: FJ202 or instructor's approval.

Course: FJ411

Title: ADV JAPANESE TRANSLATION AND INTERPRETATION

Credits: 3-0-3

Description: Designed for students pursuing a Japanese minor after starting at an advanced level, this course introduces translation and interpretation of original Japanese literary texts. The texts are selected from various genres, including poems, short stories, and folktales, written in different periods from the 8th to the 20th century. Course content includes brief discussion of the Japanese literary tradition, an introduction to the Old Japanese language and regional dialects, and discussions on social and psychological meanings of the Japanese cultural artifacts and phenomena. The course is conducted in Japanese.

Offered:

Requisites: Prerequisite: FJ202 and by instructor approval

Course: FJ412

Title: ADVANCED JAPANESE CONVERSATION

Credits: 3-0-3

Description: This course aims at further development of communication skills, particularly in listening and speaking. Reading and writing skills are integrated to reinforce the development of listening and speaking skills. Goals include: 1) expression of the student's own ideas on selected topics in a coherent and cohesive manner, 2) listening for information to take notes, 3) improving practical ability to read and present extracted information in Japanese. Class will be conducted in Japanese.

Offered:

Requisites: Prereq: FJ202 or approval of department chair.

Course: FJ420

Title: JAPANESE COMMUNICATION AS A CULTURAL PRACTICE

Credits: 3-0-3

Description: This course provides an in-depth examination of Japanese conversation and culture. Topics that may be covered include: taking turns, appropriate strategies for listening, showing agreement/disagreement, style shifting, telling a story/narrative,

and identity construction. For each topic, connections are made to appropriate cultural and conversational actions needed for communication in Japanese. FJ420 is taught in Japanese.

Offered:

Requisites: Prereq: FJ202 or instructor's approval.

Course: FJ425

Title: MEDIA STUDIES IN JAPANESE

Credits: 3-0-3

Description: The course teaches advanced reading and writing techniques by analyzing newspaper articles, periodicals, TV news and documentaries. The lectures include useful translation strategies and techniques.

Offered: Fall, Spring

Requisites: Prereq: FJ202.

Course: FL210

Title: FOUNDATIONS IN AREA STUDIES

Credits: 3-0-3

Description: Foundations in Area Studies teaches midshipmen how to analyze, understand and interpret foreign cultures through an interdisciplinary lens. This lens is essential in conveying a holistic understanding of a region. The goal of this course is for midshipmen to understand areas, regions, societies and cultures around the world from an emic perspective, to go beyond US- and Euro- centric perspectives of the world and to uncover the internal logic reflected in expressions of deep rooted cultural values. By the end of this course, students will demonstrate an understanding of the field of Area Studies, its interdisciplinary nature and application to a naval officer's career, demonstrate knowledge of common quantitative and qualitative social scientific methods and how they are applied to Area Studies and demonstrate knowledge about current discussions of the value of knowledge of languages, cultures and diverse perspectives at home and abroad.

Offered: Fall 2022-2023

Requisites:

Course: FL220

Title: LANGUAGE AND LINGUISTICS

Credits: 3-0-3

Description: Explores the nature and structure of language, including the study of sound systems (phonetics and phonology), patterns of word formation, syntax, semantics, and pragmatics (meaning in social context). Other topics include cross-cultural differences, language and social identity, the nature of textuality and writing, language processing, and first and second language acquisition.

Offered: Spring

Requisites: Prereq: HE112

Course: FL301

Title: INTERCULTURAL COMMUNICATION

Credits: 3-0-3

Description: This course explores how different cultures filter and communicate experience through their unique views. As military professionals encounter problems in contact with foreign cultures, communicating effectively with people of different cultural and ethnic backgrounds has become a professional asset. The goal of this course is to increase cultural awareness and competency and to teach communication skills useful for meaningful interaction with foreign cultures. Students will improve communication skills needed today to participate effectively in the growing global community as well as cultural diversity of American society.

Offered: Fall

Requisites: Prereq: HE111.

Course: FL302

Title: INTRO TO CULTURAL ANTHROPOLOGY

Credits: 3-0-3

Description: Introduction to Cultural Anthropology for Military Application introduces midshipmen to the concept of culture from an anthropological perspective for practical applications in military operational environments. It is designed to meet the needs of midshipmen by developing their awareness of and sensitivity to the complexity of culturally motivated behavior.

Offered: Fall 2022-2023

Requisites: Prereq: HE111

Course: FR101

Title: BASIC RUSSIAN I

Credits: 3-0-3

Description: The first of a two-course introduction to Russian culture and daily life through the use of communicative approaches to language, with emphasis on listening comprehension and speaking. The courses develop basic reading and writing skills, and provide insights into contemporary society and behavioral norms. If taken and passed at USNA, may be used as a free elective by STEM majors.

Offered: Fall 2022-2023

Requisites: Prereq: None.

Course: FR102

Title: BASIC RUSSIAN II

Credits: 3-0-3

Description: A continuation of FR101. If taken and passed, may be used in place of a 200 level humanities-social science elective in Division I and II majors.

Offered: Spring

Requisites: Prereq: FR101.

Course: FR201

Title: INTERMEDIATE RUSSIAN I

Credits: 3-0-3

Description: Continues development of oral, reading and writing skills with the emphasis on spoken Russian. Includes area and cultural topics.

Offered: Fall 2022-2023

Requisites: Prereq: FR102.

Course: FR202

Title: INTERMEDIATE RUSSIAN II

Credits: 3-0-3

Description: Continues development of oral, reading and writing skills with the emphasis on spoken Russian. Includes area and cultural topics.

Offered: Spring

Requisites: Prereq: FR201.

Course: FR309

Title: LANGUAGE IMMERSION ABROAD – RUSSIAN

Credits: 3-0-3

Description: This LSAP immersion course entails language and culture immersion through classroom and experiential learning in the context of an academic program in the specific host country vetted by the appropriate USNA faculty in the Languages and Cultures Department. Each LSAP program is designed to facilitate development of midshipmen's language skills and to promote their understanding of social, cultural and historical aspects of the target country. Every LSAP program is designed with a minimum of 45 contact hours of language instruction in addition to 15 hours of cultural learning and excursions in the host country. FR309 offers three credits to students who successfully complete a four week LSAP program abroad with a passing grade. In order to receive credit and appropriate placement, students must complete the Languages and Cultures Department's program assessment as specified by the program manager at a level of C or above to receive three validation credits, and to be placed into the appropriate level of the USNA language program in order to continue language gains in the classroom upon return. FR309 will

reflect credits earned during LSAP, if and only if the experience of the language immersion abroad CANNOT be mapped onto an existing language course at USNA.

Offered:

Requisites: Prereq: FR202 or equivalent

Course: FR330

Title: THIRD-YEAR RUSSIAN I

Credits: 3-0-3

Description: The goal of this course is to enable midshipmen to develop functional communicative proficiency in Russian in all four skill areas, reading, writing, speaking, and listening, while expanding their understanding of Russian culture. The course introduces vocabulary and sentence structures required for effective communication. Course materials will include multimedia materials introducing midshipmen to contemporary mass media and popular culture.

Offered: Fall 2022-2023

Requisites: Prereq: FR202.

Course: FR340

Title: THIRD-YEAR RUSSIAN II

Credits: 3-0-3

Description: In this course midshipmen will continue to expand their functional proficiency in all four language skill areas. They will use their Russian language skills to learn about Russia's recent past and about contemporary issues in Russia. The course introduces advanced vocabulary and grammar required for comprehension of more formal registers. The course incorporates web-based video and print media sources.

Offered:

Requisites: Prereq: FR202.

Course: FR350

Title: RUSSIAN LIT & CULTURE IN TRANSLATION

Credits: 3-0-3

Description: This course uses English translations of classic Russian texts which impact the way Russians behave and think about themselves today. Through Russian literature, music and film, students gain deep insights into Russian culture. Counts as an upper level Humanities-Social Science course.

Offered: Fall

Requisites: Prereq: None.

Course: FR411

Title: ADVANCED RUSSIAN

Credits: 3-0-3

Description: This course introduces midshipmen to vocabulary and grammar needed to read and comprehend more advanced texts. The course will focus primarily on texts from media sources, but conversation language will also be incorporated. Strategies for translation and comprehension of advanced texts will be covered. Midshipmen will be exposed to increasingly complex texts throughout the semester.

Offered:

Requisites: Prereq: FR340 or approval of department chair.

Course: FR412

Title: CONTEMPORARY RUSSIA

Credits: 3-0-3

Description: In this advanced level course midshipmen develop active and passive language skills, using them to explore contemporary social, cultural, economic, political, and military issues in Russia. The course introduces vocabulary and sentence structures required for oral and written expression at the advanced level. The course material will incorporate multimedia and print material from a broad array of sources.

Offered:

Requisites: Prereq: FR340 or approval of department chair.

Course: FR460

Title: ADVANCED RUSSIAN THROUGH FILM

Credits: 3-0-3

Description: This course uses film as a medium for developing advanced Russian language proficiency while increasing awareness and understanding of Russian culture. Drawing from the canon of well-known Russian film classics, dating from the Soviet period to the present day, the course will explore Russian culture and identity. The canon of popular film will provide students with insight into the evolution of Russian life and society in the Soviet and post-Soviet period. The goal of the course is to help midshipmen improve language skills in all areas, speaking, reading, oral comprehension, and writing, enabling midshipmen to become literate and effective communicators in Russian.

Offered:

Requisites: Prerequisite: FR340

Course: FS103

Title: BASIC SPANISH I

Credits: 3-0-3

Description: The first of a two-course sequence emphasizing the development of listening and speaking skills in the context of grammar review and with a focus on sophisticated verbal constructions. Both semesters underscore exposure to real cultural materials (readings, video, Internet) and communicative situations.

Offered: Fall 2022-2023

Requisites: Prereq: One year of senior high school Spanish or approval of department chair.

Course: FS104

Title: BASIC SPANISH II

Credits: 3-0-3

Description: The continuation of the two-course sequence FS103-104 emphasizing the development of listening and speaking skills in the context of grammar review and with a focus on sophisticated verbal constructions. Emphasis is placed on vocabulary building, narration in the past, acquisition of idiomatic constructions, and advanced sentence structures requiring the subjunctive. Both semesters underscore exposure to real cultural materials (readings, video, Internet) and communicative situations.

Offered: Spring

Requisites: Prereq: FS103

Course: FS201

Title: INTERMEDIATE SPANISH I

Credits: 3-0-3

Description: Intermediate Spanish I continues the development of all four language skills--speaking, listening comprehension, reading and writing--begun in Basic Spanish. Emphasizes expansion of both active and passive vocabulary, use of more complex language structures and the development of cultural literacy. Taught in Spanish.

Offered: Fall 2022-2023

Requisites: Prereq: FS104.

Course: FS202

Title: INTERMEDIATE SPANISH II

Credits: 3-0-3

Description: Intermediate Spanish II continues the development of all four language skills--speaking, listening comprehension, reading and writing--begun in Intermediate Spanish I. Emphasizes expansion of both active and passive vocabulary, use of more complex language structures and the development of cultural literacy. Taught in Spanish.

Offered: Spring

Requisites: Prereq: FS201.

Course: FS301

Title: ADVANCED SPANISH W/ READINGS ON CONTEMPORARY SPANISH AMERICA

Credits: 3-0-3

Description: Develops linguistic proficiency in speaking and writing with readings and videos on Contemporary Spanish-American culture. Includes grammar reviews, internet searches, computer-based materials, newspaper articles, and literary selections that address current issues involving Spanish-speaking nations in this hemisphere.

Offered: Fall 2022-2023

Requisites: Prereq: FS202.

Course: FS304

Title: ADVANCED SPANISH WITH READINGS ON CONTEMPORARY SPAIN

Credits: 3-0-3

Description: Develops linguistic proficiency in speaking and writing with readings and videos on contemporary Spain. Includes grammar reviews, Internet searches, computer-based materials, newspaper articles, and literary selections that address current issues in Spain since Franco. Also includes naval terminology.

Offered:

Requisites: Prereq: FS202.

Course: FS309

Title: LANGUAGE IMMERSION ABROAD – SPANISH

Credits: 3-0-3

Description: This LSAP immersion course entails language and culture immersion through classroom and experiential learning in the context of an academic program in the specific host country vetted by the appropriate USNA faculty in the Languages and Cultures Department. Each LSAP program is designed to facilitate development of midshipmen's language skills and to promote their understanding of social, cultural and historical aspects of the target country. Every LSAP program is designed with a minimum of 45 contact hours of language instruction in addition to 15 hours of cultural learning and excursions in the host country. FS309 offers three credits to students who successfully complete a four week LSAP program abroad with a passing grade. In order to receive credit and appropriate placement, students must complete the Languages and Cultures Department's program assessment as specified by the program manager at a level of C or above to receive three validation credits, and to be placed into the appropriate level of the USNA language program in order to continue language gains in the classroom upon return. FS309 will reflect credits earned during LSAP, if and only if the experience of the language immersion abroad CANNOT be mapped onto an existing language course at USNA.

Offered:

Requisites: Prereq: FS202 or equivalent

Course: FS412

Title: CONTEMPORARY LATIN AMERICAN CIVILIZATION

Credits: 3-0-3

Description: Past and current social, economic, cultural and political patterns and problems.

Offered: Spring

Requisites: Prereq: FS301 and FS304, or approval of department chair.

Course: FS413

Title: SPANISH CIVILIZATION

Credits: 3-0-3

Description: Culture and civilization of Spain from the Roman period through the 20th century supplemented by videos, readings and classroom discussion.

Offered: Fall 2022-2023

Requisites: Prereq: FS301 and FS304, or approval of department chair.

Course: FS421

Title: SPANISH LITERATURE

Credits: 3-0-3

Description: Representative works such as The Cid and Don Quixote reflecting the culture, ethics and values of Spain in its major literary periods.

Offered: Fall

Requisites: Prereq: FS301 and FS304, or approval of department chair.

Course: FS422

Title: SPANISH AMERICAN LITERATURE

Credits: 3-0-3

Description: Novels, stories, essays, poetry and plays reflecting the culture, ethics and values of major Spanish American countries from the colonial era to the present.

Offered: Spring

Requisites: Prereq: FS301 and FS304, or approval of department chair.

Course: FT220

Title: INTENSIVE PORTUGUESE FOR STUDENTS OF SPANISH I

Credits: 3-0-3

Description: Designed for students who have completed intermediate level Spanish; uses knowledge of Spanish as the basis for rapid acquisition of Portuguese vocabulary and grammar. Learning through all four fundamental skills: speaking, listening, reading and writing; plus translation. Emphasis on phonetics (pronunciation) and verb forms, with attention to differences from and similarities to Spanish. Students will cover approximately one year's worth of material in one semester. Required work includes grammar exercises, speaking practice, writing of brief essays, conversation and formal presentations. Taught almost entirely in Portuguese. Qualifies for HumSS1 elective credit.

Offered:

Requisites: Prereq: FS202 or permission of instructor and Dept Chair.

Political Science Department Courses (FP)

Course: FP130

Title: U.S. GOVT AND CONSTITUTIONAL DEV

Credits: 3-0-3

Description: Basic concepts of American democracy, the Constitution, political process, structure and functions of national government and factors influencing its operation; emphasis on legal and ethical demands placed on government officials, both civilian and military, as defined by the Constitution and statute.

Offered: Fall 2022-2023

Requisites: Prereq: None.

Course: FP130X

Title: U. S. GOVERNMENT AND CONSTITUTIONAL DEVELOPMENT

Credits: 3-0-3

Description: The basic concepts of American democracy and the Constitution placed in a comparative context for midshipmen from foreign countries.

Offered: Fall 2022-2023

Requisites: Prereq: This version of FP130 is for foreign nationals.

Course: FP210

Title: INTRO TO INTERNATIONAL RELATIONS

Credits: 3-0-3

Description: Approaches to analysis of international relations; nature and evolution of international political systems; foreign policy decision making; roles of non-state actors; diplomacy and war; Third World economic development; and international institutions.

Offered: Fall 2022-2023

Requisites: Prereq: FP130.

Course: FP220

Title: POLITICAL SCIENCE METHODS

Credits: 3-0-3

Description: A discussion of the philosophy of science for the political scientist; instruction in research methods with emphasis on scientific method and quantitative techniques.

Offered: Fall 2022-2023

Requisites: Prereq: FP130.

Course: FP230

Title: INTRO TO COMPARATIVE POLITICS

Credits: 3-0-3

Description: Introduces midshipmen to the study of politics in other societies. A course in comparative politics offers students a basic framework for analyzing other political systems. Key theoretical concepts, analytical tools and seminal works in the field are introduced to lay the foundation for advanced area studies coursework.

Offered: Fall 2022-2023

Requisites: Prereq: FP130.

Course: FP310

Title: INTRODUCTION TO GLOBAL STRATEGIC STUDIES

Credits: 3-0-3

Description: Examination of the global international system from the strategic perspective to enhance our understanding of the processes and dynamics of global changes and their impact on professional careers in the naval service.

Offered: Spring

Requisites: Prereq: FP130.

Course: FP311

Title: ETHICS AND INTERNATIONAL RELATIONS

Credits: 3-0-3

Description: At the outset, the focus is on a study of the dominant theories of international relations, particularly Bismarkian realism and Wilsonian idealism. Then, using historical and fictional cases, passages from literature, and guest speakers, this course explores case studies that illustrate the ethical dilemmas that arise in the relations between states. By contrast with courses that treat ethical issues for an individual, this course deals with the acts of states and of other groups such as insurgency movements, non-governmental organizations, and international affiliations.

Offered: Spring

Requisites: Prereq: FP130.

Course: FP313

Title: INFORMATION TECHNOLOGY AND INTERNATIONAL POLITICS

Credits: 3-0-3

Description: Effects of information technology on both the national and international political systems; emphasis on changed weaponry, the vulnerability of cyberspace and other aspects of the information revolution on the relations among nations.

Offered: Fall 2022-2023

Requisites: Prereq: FP210.

Course: FP314

Title: FORMULATION OF U. S. FOREIGN POLICY

Credits: 3-0-3

Description: Case study-based review of the content, formulation and execution of U.S. foreign policies since World War II, including decision-making processes, administration of policy and development of current policies.

Offered: Fall

Requisites: Prereq: FP130.

Course: FP320

Title: ADV POLITICAL SCI METHODS

Credits: 3-0-3

Description: Advanced methods for the analysis of quantitative data in political science. Topics include models for binary, count, and ordinal outcomes. Methods are illustrated with published examples from all fields of political science, including studies of conflict, voter behavior, and public opinion. Prepares students to use appropriate methods for empirical research in Honors and Capstone classes.

Offered: Spring

Requisites: Prereq: FP220 or approval of department chair.

Course: FP322

Title: COMPARATIVE EUROPEAN POLITICS

Credits: 3-0-3

Description: Study of foreign and domestic policy issues and processes of major European political systems as well as NATO, the European Union, and the U.S.-European relationship.

Offered: Spring

Requisites: Prereq: FP130.

Course: FP323

Title: COMPARATIVE LATIN AMERICAN POLITICS

Credits: 3-0-3

Description: Social, economic and political environments; democracy and accountability; US-Latin America relations; regimes and government institutions; theories of Latin American political development with country case studies.

Offered:

Requisites: Prereq: FP130

Course: FP324

Title: LATIN AMERICAN INTERNATIONAL POLITICS

Credits: 3-0-3

Description: Latin American international subsystem; foreign policy making of Latin American states, United States, Europe, Japan and others; roles of non-state actors; international institutions; diplomacy and violence; and application of international theory.

Offered: Spring

Requisites: Prereq: FP130.

Course: FP325

Title: AMERICAN POLITICAL PHILOSOPHY

Credits: 3-0-3

Description: The theories and practices of Jefferson, Madison, Lincoln, Calhoun, Martin Luther King and other seminal American political thinkers; special emphasis on societal progress and public policy ambiguity under the banner of Liberty and Equality.

Offered: Spring

Requisites: Prereq: FP130.

Course: FP326

Title: AMERICAN PRESIDENCY

Credits: 3-0-3

Description: An examination of the presidential selection process and of the nature of presidential power in both the domestic and international spheres, with a focus on the ways in which they are both enhanced and constrained by other actors in the political system, including Congress, the judicial branch, the bureaucracy, the media, and the public.

Offered: Fall, Spring

Requisites: Prereq: FP130.

Course: FP328

Title: LEGISLATIVE PROCESS

Credits: 3-0-3

Description: Decision making in the U.S. Congress; constituencies and elections, role of party and committees, and interaction with executive and judicial branches, bureaucracy, interest groups and other actors.

Offered: Fall 2022-2023

Requisites: Prereq: FP130.

Course: FP340

Title: MODERN POLITICAL THOUGHT AND IDEOLOGY

Credits: 3-0-3

Description: Introduces students to the components of contemporary political ideas and principles. Course distinguishes among philosophical arguments and social movements and emphasizes how distinction blurred during 20th century. Key concerns include social justice, equality, liberty and rights. Readings range from extremes of anarchism to debates about feminism and environmentalism.

Offered: Fall 2022-2023

Requisites: Prereq: FP130.

Course: FP341

Title: POLITICAL PSYCHOLOGY

Credits: 3-0-3

Description: Introduction to psychological concepts and approaches used to analyze politics. Topics covered include acquisition of personal political attitudes and beliefs; the dynamics of public opinion; theories underlying PsyOp (Psychological

Operations), riots, revolutions and wars; and psychological sources of effective and defective decisions in small group settings such as juries, military commands and policy settings.

Offered: Fall 2022-2023

Requisites: Prereq: FP130.

Course: FP345

Title: ENVIRONMENTAL POLITICS AND SECURITY

Credits: 3-0-3

Description: Examines major environmental problems currently influencing U.S. domestic and security policies. Explores major theories and public policy controversies related to global warming, pollution, land, air, water degradation and scarcity, and biodiversity. Discusses enduring and novel ethical issues. Special emphasis placed on DoD environmental programs.

Offered: Fall 2022-2023

Requisites: Prereq: FP130.

Course: FP355

Title: CIVIL-MILITARY RELATIONS

Credits: 3-0-3

Description: An examination of the interplay between civilians and the military in a liberal democratic society. The course blends of theory, practice, policy, sociology, history and political philosophy to examine the relationship of the professional military to the society which it serves.

Offered: Fall 2022-2023

Requisites: Prereq: FP130

Course: FP356

Title: WAR AND CONFLICT IN THE INTERNATIONAL SYSTEM

Credits: 3-0-3

Description: This course looks in depth at theoretical explanations of the causes and consequences of conflict in the International System especially since the end of the cold war as well as opportunities for peace and cooperation.

Offered: Fall 2022-2023

Requisites: Prereq: FP130

Course: FP357

Title: POLITICS OF CHINA AND JAPAN

Credits: 3-0-3

Description: An examination of the Chinese/Japanese political system with emphasis on the dynamic interaction of traditional and Marxist ideological forces.

Offered: Fall

Requisites: Prereq: FP130.

Course: FP360

Title: US FOREIGN POLICY IN THE MIDDLE EAST

Credits: 3-0-3

Description: This course examines the causes and consequences of US Middle East policy. It explains the evolution of US interests in the region, and explores the shifting alliances linked with US power projection in the Middle East. Throughout the course, we will look at the strategic value of the Middle East, conflict and cooperation with and among regimes in the region, and the role that factors such as natural resources, democracy, economic development, weapons, and terrorism play in shaping US Middle East policy.

Offered:

Requisites: Prereq: FP130 and FP210, or permission of department chair.

Course: FP365

Title: AFRICAN COMPARATIVE POLITICS

Credits: 3-0-3

Description: Analysis of political trends and constitutional development of African political systems; their relations with one another and outside world; attention directed to U.S. security interests in Africa.

Offered: Spring

Requisites: Prereq: FP130.

Course: FP366

Title: AFRICAN INTERNATIONAL RELATIONS

Credits: 3-0-3

Description: Contemporary politics, violent conflict, and political economy of development in Africa, with an emphasis on issues of international intervention.

Offered:

Requisites:

Course: FP367

Title: POLITICS OF RUSSIA

Credits: 3-0-3

Description: Examines the context of Russian foreign policy following the collapse of the Soviet Union. There are three parts to the course: historical roots of Russian foreign and security policy, contemporary developments, and the unique challenges Russia poses in the modern geopolitical landscape. After a period of relative decline in the 1990s, the Kremlin has sought to aggressively reassert its foreign policy agenda. This course will examine key political events of the 1990s and 2000s, such as Russian opposition to NATO expansion, Chechen Wars, the Kosovo Campaign, and the Color Revolutions. The course will include discussions on economic and political developments since the foundation of the Russian Federation. It will further examine Russia's role in recent conflicts in Georgia, Syria, and Ukraine, while discussing the concerns of a resurgent Russian regional hegemon. Yet, it will also examine areas of cooperation between the West and Russia, such as arms control, nuclear proliferation, cybersecurity, the Arctic, and counterterrorism.

Offered: Fall

Requisites: Prereq: FP130 (FP210 highly recommended).

Course: FP368

Title: COMPARATIVE ASIAN POLITICS

Credits: 3-0-3

Description: Systematic comparative approach to the study of political systems in East and Southeast Asia (with country cases selected from the Koreas, Taiwan, Malaysia, Myanmar, Indonesia, Philippines, Singapore, Thailand and Vietnam); theoretical emphasis on ethnic conflict, economic development and democratization.

Offered: Spring

Requisites: Prereq: FP130.

Course: FP369

Title: MIDDLE EASTERN POLITICS

Credits: 3-0-3

Description: Comparative analysis of domestic politics, political economy, the role of religion, foreign policies, and elements of international relations of Middle Eastern political systems; theoretical emphasis on ethnic conflict, conflict resolution and democratic development.

Offered: Fall 2022-2023

Requisites: Prereq: FP130.

Course: FP370

Title: RUSSIAN FOREIGN POLICY

Credits: 3-0-3

Description: This course examines the context of Russian foreign policy following the collapse of the Soviet Union. After a period of relative decline, Russia has begun to aggressively reassert its foreign policy agenda. Conflict with Ukraine, Russian

opposition to NATO, and the fear of a new Cold War dominate the news as it pertains to Russia even while the West seeks Russian cooperation in several critical areas. The course will address historical roots of Russian foreign and security policy; contemporary developments, and unique challenges in Europe, Asia, the Middle East, and the Arctic.

Offered:

Requisites: Prereq: FP130 (FP210 highly recommended).

Course: FP371

Title: ASIAN INTERNATIONAL POLITICS

Credits: 3-0-3

Description: Analysis of interstate relations of selected East and Southeast Asian states; concentration on regional organizations, security alliances and bilateral arrangements.

Offered: Fall 2022-2023

Requisites: Prereq: FP130.

Course: FP372

Title: POLITICAL PARTIES, CAMPAIGNS AND INTEREST GROUPS

Credits: 3-0-3

Description: Study of dynamics of group politics in the U.S. political system; emphasizes roles played by parties, interest groups, public opinion and elections in the U.S. political process.

Offered: Fall 2022-2023

Requisites: Prereq: FP130.

Course: FP375

Title: POLITICS AND THE MEDIA

Credits: 3-0-3

Description: A comprehensive analysis of how print, electronic and computer-based mass media choose, cover, and disseminate information about American politics and government. Analysis of contemporary media from the perspective of subjects, disseminators and consumers of the news.

Offered: Fall

Requisites: Prereq: FP130.

Course: FP384

Title: POLITICS OF IRREGULAR WARFARE

Credits: 3-0-3

Description: Theoretical, historical and policy examination of low-level political-military confrontation; viewed from several perspectives, such as revolutionary, policy-making, military and nation-state; focus on U.S. response to LIC.

Offered: Fall 2022-2023

Requisites: Prereq: FP130, 2/C.

Course: FP393

Title: CIVIL WARS AND ARMED CONFLICT

Credits: 3-0-3

Description: This course will embark on an effort to rigorously assess the causes, dynamics, and outcomes of civil wars and internal armed conflict. In the modern era, there have been over 200 intra-state conflicts - the intensity of violence, their seeming preventability, and the investment of significant resources by major powers make the study of civil wars relevant to future military officers.

Offered: Fall 2022-2023

Requisites:

Course: FP397

Title: CRIMINAL LAW AND JUSTICE

Credits: 3-0-3

Description: An examination of both (1) the criminal justice system and the requirements of due process as mandated by the Constitution (double jeopardy, coerced confessions, plea bargaining, etc.) and (2) the criminal law -- the nature of criminal intent, the criminal act, the defenses (self-defense, insanity, etc.) as illustrated in such common law felonies as murder, rape, robbery, and battery.

Offered: Fall, Spring

Requisites: Prereq: FP130, 2/C.

Course: FP407

Title: INTELLIGENCE AND NATIONAL SECURITY

Credits: 3-0-3

Description: Examination of nature, significance and development of intelligence including collection, counterintelligence, clandestine and covert action and evaluation; includes current issues and case studies.

Offered: Fall

Requisites: Prereq: FP130, FP210, and 1/C or 2/C standing.

Course: FP408

Title: INTERNATIONAL LAW

Credits: 3-0-3

Description: Survey of public law of nations including jurisdiction, citizenship, nationality, human rights, and treaty law. This course places special emphasis on the law of the sea, the law of war, and the legal issues involving the use of force by states.

Offered: Spring

Requisites: Prereq: FP210.

Course: FP413

Title: CONSTITUTIONAL LAW: FEDERAL SYSTEM

Credits: 3-0-3

Description: An analysis of key Supreme Court decisions interpreting the power of the judiciary, the executive and congress under the Constitution; nation-state relations; the commerce power; economic liberties.

Offered: Fall

Requisites: Prereq: FP130.

Course: FP414

Title: CONSTITUTIONAL LAW: CIVIL LIBERTIES

Credits: 3-0-3

Description: An analysis of leading Supreme Court decisions in the areas of speech, press, and religion; equal protection of minorities and women; privacy.

Offered: Fall

Requisites: Prereq: FP130.

Course: FP420

Title: PUBLIC POLICY ANALYSIS

Credits: 3-0-3

Description: Analysis of U.S. public policy toward social and economic problems, including nature of social choice; survey of selected policy areas, such as health care, education, housing and economic and social welfare.

Offered: Spring

Requisites: Prereq: FP130.

Course: FP421

Title: NATIONAL SECURITY POLICY

Credits: 3-0-3

Description: Examination of interaction of domestic and foreign political and military considerations in the formulation and execution of national security policy; use of case studies and review of current strategic policies.

Offered: Fall 2022-2023

Requisites: Prereq: FP130, FP210.

Course: FP430

Title: POLITICAL PHILOSOPHY

Credits: 3-0-3

Description: Study of Western political philosophy, with emphasis on roots of democracy and the meaning of justice; explores relationship between individual and society, as well as the sources of a state's power and authority; examines works of major thinkers from Plato to the present.

Offered: Fall 2022-2023

Requisites: Prereq: FP130, FP210.

Course: FP437

Title: INTERNATIONAL ORGANIZATIONS

Credits: 3-0-3

Description: International organizations in world politics; attention given to control of conflict and violence, economic cooperation and management of global resources; major focus on the United Nations; discussion of selected regional issues and other organizations.

Offered: Spring

Requisites: Prereq: FP130 and FP210.

Course: FP440

Title: POLITICS OF CENTRAL EUROPE

Credits: 3-0-3

Description: Analysis of the politics of Eastern Europe from a comparative prospective; the struggle for national identity and economic development in the post-communist environment.

Offered: Fall

Requisites: Prereq: FP130.

Course: FP450

Title: INTERNATIONAL POLITICAL ECONOMY

Credits: 3-0-3

Description: This course examines the historical and theoretical foundations of contemporary international political economy. It explores the evolving association between government and economics stressing the roles of mercantilism, liberalism and globalization. It explores the political and economic influence of US national agencies as well as international organizations during the latter half of the 20th century.

Offered: Spring

Requisites: Prereq: FP210 or instructor permission.

Course: FP468

Title: PALESTINIAN - ISRAELI CONFLICT

Credits: 3-0-3

Description: The conflict between Arabs and Jews over Palestine is one of the most important factors shaping Middle East politics. The impact of this conflict affects local Arabs and Jews, regional actors and global partners. To date, the Palestinian-Israeli conflict has produced a series of wars and recurring patterns of violence. This course identifies key actors and motivations in the conflict as well as the conflict's intractability. Peace processes are also a topic of discussion.

Offered: Spring

Requisites: Prereq: FP369 or approval of department chair.

Course: FP469

Title: ISLAM AND POLITICS

Credits: 3-0-3

Description: This course provides an overview of the relationship between Islam and politics. It covers important political developments in Muslim history: starting with the Prophet Muhammad's time, the establishment of the early Muslim community, the development of the Caliphates, the role of the Shari'ah (Islamic Law), the decline of Islamic societies, and their revival in modern times. Additional attention is given to selected topics, such as contemporary Islamic movements, the status of minorities in Islamic societies, the role of women, and the question of violence.

Offered: Fall, Spring

Requisites: Prereq: FP360 or FP369 or approval of department chair.

Course: FP471

Title: CAPSTONE SEMINAR

Credits: 3-0-3

Description: The capstone seminar in Political Science provides a directed research experience designed to pull together key elements of the area of concentration. Midshipmen prepare a comprehensive research paper that demonstrates their mastery of substantive knowledge and competence in applying writing and research skills.

Offered: Fall, Spring

Requisites: Prereq: 1/C FPS majors only.

Course: FP476

Title: GRAND STRATEGY AND GREAT-POWER POLITICS

Credits: 3-0-3

Description: Grand strategy is a coherent statement of the state's highest political ends to be pursued globally over the long term. Its proper function is to prioritize among different domestic and foreign policy choices and to balance national means-diplomatic, economic, military- to achieve the articulated ends. The class will review the historical foundations of strategy, analyze the evolution of American strategy from the Founding Fathers to the current day (including current US National Security Strategy) and explore the foundations of strategy worldwide from a regional perspective with an emphasis on the roles of history, religion, culture and geography in shaping various countries and region's approach to grand strategy.

Offered:

Requisites: Prereq: FP130; FP210

Course: FP480

Title: IT RESEARCH SEMINAR (FP)

Credits: 3-0-3

Description:

Offered:

Requisites:

Course: FP500

Title: HONORS ADVANCED RESEARCH DESIGN

Credits: 2-0-2

Description: Advanced research techniques: individual design guidance with special reference to advanced statistical techniques as well as methodological approaches. Literature review and presentation to the faculty.

Offered: Spring

Requisites: Prereq: FPS 2/C honors students only. Honors Director permission required.

Course: FP505

Title: HONORS SENIOR SEMINAR

Credits: 3-0-3

Description: An advanced research seminar to carry out the research to culminate in a senior honors thesis.

Offered: Fall 2022-2023

Requisites: Prereq: FP500, 1/C FPSH major.

Course: FP510

Title: HONORS SENIOR THESIS

Credits: 3-2-4

Description: An advanced research seminar allowing students to complete the research that will culminate in their senior honors thesis.

Offered:

Requisites: Prereq: 1/C FPSH major.

Courses in the School of Mathematics and Science

Chemistry Department Courses (SB, SC)

Course: SB201

Title: BIOLOGY FOR THE NAVAL OFFICER

Credits: 3-0-3

Description: Students will learn basic biology in the context of its applications to everyday life and their future duties in the Naval Service. Topics will include biomechanics, human performance, diet and nutrition, hormones, genetics and the human genome, genetic engineering, DNA "fingerprinting", disease, resistance and immunity. Note: Students cannot get credit for both SB201 and SB211 or SB201 and SB251.

Offered: Spring

Requisites: Prereq: None.

Course: SB211

Title: BIOLOGY FOR NAVAL OFCR W LAB

Credits: 3-2-4

Description: Students will learn basic biology in the context of its applications to everyday life and their future duties in the Naval Service. Topics will include biomechanics, human performance, diet and nutrition, hormones, genetics and the human genome, genetic engineering, DNA "fingerprinting", disease, resistance and immunity. Laboratories are designed to reinforce and expand upon topics from lecture. Note: Students cannot get credit for both SB201 and SB211 or SB211 and SB251.

Offered: Spring

Requisites: Prereq: None.

Course: SB251

Title: FUNDAMENTALS OF BIOLOGY

Credits: 3-2-4

Description: This course gives students a rigorous background in the fundamental principles of biology: cell structure and function, classical and molecular genetics, and evolution. The perspective of the course is from life as a whole, with a focus on the position of humans in the overall scheme

Offered: Fall 2022-2023

Requisites: Prereq: None.

Course: SB252

Title: HUMAN PHYSIOLOGY AND ANATOMY

Credits: 3-2-4

Description: This course provides students with a rigorous background in the mechanisms of body function, focusing on the control and major homeostatic systems of the body. Physiology is studied at scales ranging from the molecular to the whole organism, with an ultimate emphasis on integrating all organ systems. Laboratory sessions focus on anatomy and histology, emphasizing the complementarity of structure and function

Offered: Fall 2022-2023

Requisites: Prereq: SB251.

Course: SB338

Title: MOLECULAR & GENERAL GENETICS

Credits: 3-0-3

Description: Students in this course will study the inheritance of traits, starting with basic (Mendelian) genetics and ending with modern molecular biology. The course will examine incomplete dominance, epistasis, pleiotropy, transformation, cloning, genetic engineering, imprinting, and experimental techniques. Co-listed as SC338.

Offered: Spring

Requisites: Prereq: SB251 or SC335.

Course: SB431

Title: MICROBIAL CHEMISTRY

Credits: 2-2-3

Description: This course will explore the interesting and important interactions that occur between microbes and their surroundings, including human hosts and extreme environments. Species of these "simple" organisms have evolved diverse mechanisms to combat assault by antibiotics, heavy metals, pollutants and extreme irradiation. The lab component of the class will include identifying, cultivating and testing organisms with survival mechanisms of interest. Co-listed as SC431.

Offered: Fall

Requisites: Prereq: SB251 and SC335.

Course: SB453

Title: NEUROSCIENCE AND DEVELOPMENT

Credits: 3-2-4

Description: Neuroscience and Developmental Biology is an advanced treatment of neuroscience and developmental biology that builds on both the molecular and cellular background provided in SB251 and the basic principles underlying nervous system function introduced in SB252 and applies them to topics including both somatic and special sensory modalities, initiation, execution and coordination of motor programs and the neuroanatomical organization of the pathways that control these functions. Additional special topics will be introduced on a rotating basis. The course will also use the examples set by studies performed in model organisms to elucidate the mechanisms by which normal development proceeds in higher eukaryotes with an emphasis on neural development.

Offered: Fall 2022-2023

Requisites: Prereq: SB252.

Course: SC111

Title: FOUNDATIONS OF CHEMISTRY I

Credits: 3-2-4

Description: The first in a two-semester sequence presenting the fundamental laws and theories of chemistry. Major topics include chemical stoichiometry, periodic trends, atomic structure, chemical equilibrium, thermodynamics, nuclear chemistry, electrochemistry and kinetics. The lecture material is complemented with experiments designed to develop the student's laboratory skills. Naval applications of chemistry are introduced throughout the courses to provide an awareness of chemistry in normal Navy operations.

Offered: Fall 2022-2023

Requisites: Prereq: None.

Course: SC112

Title: FOUNDATIONS OF CHEM II

Credits: 3-2-4

Description: This is the second in the two-course foundations of chemistry sequence. See SC111 for a general course description. In this version of SC112, naval applications of chemistry including body armor, corrosion, nuclear power, boiler water quality, aircraft deicing, and scuba diving will be emphasized.

Offered: Summer 2022-2023

Requisites: Prereq: SC111.

Course: SC151

Title: MODERN CHEMISTRY

Credits: 3-2-4

Description: A one-semester course for the well-prepared student, satisfying the plebe year chemistry requirement. Students entering this course must have demonstrated their understanding of fundamental chemical concepts by a strong performance on the chemistry validation exam.

Offered: Fall 2022-2023

Requisites: Prereq: Placement by department chair.

Course: SC216

Title: ANALYTICAL CHEMISTRY

Credits: 3-0-3

Description: This course explores the theory and application of "wet" chemical methods and instrumentation in determining the chemical composition and structure of matter. Both qualitative and quantitative aspects of chemical analysis will be addressed. The theories and techniques learned in this course can be used in all branches of chemistry and will be applied in subsequent chemistry courses in the chemistry major.

Offered: Spring

Requisites: Prereq: SC225.

Course: SC221

Title: CHEMISTRY IN MODERN WARFARE

Credits: 3-0-3

Description: This course will examine the science behind conventional weapons and weapons of mass destruction. The course will begin by examining high explosives and propellants by studying the structure, synthesis, and properties of these materials. The second part of the course will focus on chemical and biological agents to include history, structure, modes of action, detection, protective measures, and methods of decontamination.

Offered: Fall

Requisites: Prereq: SC112.

Course: SC225

Title: ORGANIC CHEMISTRY I

Credits: 3-0-3

Description: The first of a two-semester sequence of courses focused on the chemistry of covalent compounds of carbon, the "molecules of life." Many important concepts from general chemistry (stoichiometry, bonding, structure, kinetics, and thermodynamics) are used and expanded upon. New concepts include conformational analysis, stereochemistry, reaction mechanisms and molecular orbital theory.

Offered: Fall 2022-2023

Requisites: Prereq: SC112 or SC151; Coreq: SC261.

Course: SC226

Title: ORGANIC CHEMISTRY II

Credits: 3-0-3

Description: This is the second in the two-course sequence in organic chemistry. See SC225 for a course description.

Offered: Spring

Requisites: Prereq: SC225 and SC261; Coreq: SC262.

Course: SC261

Title: INTEGRATED LAB I - RXNS, SEPARATION, PURIFICATION

Credits: 0-6-2

Description: This laboratory course emphasizes the theory and practice of separating and purifying chemical substances. Techniques include crystallization, distillation, column chromatography, gas chromatography, high-performance liquid chromatography, extraction, and sublimation. Identification of chemical substances based on infrared and nuclear magnetic resonance spectroscopy are introduced.

Offered: Fall 2022-2023

Requisites: Prereq: SC112 or SC151; Coreq: SC225.

Course: SC262

Title: INTEGRATED LABORATORY II

Credits: 0-6-2

Description: Qualitative and quantitative methods are applied in the determination of the products of several important chemical reactions, including a multistep synthesis. Students also apply these methods in the analysis of simple equilibrium systems and the separation and identification of a two-component unknown.

Offered:

Requisites: Prereq: SC225 and SC261; Coreq: SC226.

Course: SC311

Title: MARINE AND ATMOSPHERIC CHEM

Credits: 3-0-3

Description: An introduction to chemical processes that influence the chemistry of marine waters and the atmospheric marine boundary layer. The course will begin with the composition of seawater and progress towards an understanding of the biogeochemical cycles of important elements in oceanic systems, including the chemistry of tropospheric ozone and aerosol formation. The impact these process have on current and future naval operations will be discussed.

Offered: Spring

Requisites: Prereq: SC112.

Course: SC325

Title: ADVANCED ORGANIC CHEMISTRY

Credits: 3-0-3

Description: Building on the foundation of SC225-226, this course will apply fundamental topics such as stereochemistry, conformation, structure, bonding and mechanisms to advanced topics such as pericyclic reactions, heterocyclic compounds, and the relationship between structure and function of biochemically important organic compounds.

Offered: Fall

Requisites: Prereq: SC226.

Course: SC335

Title: BIOCHEMISTRY

Credits: 3-0-3

Description: The chemical basis of life will be examined by studying the relationship between the structure and the function of biological macromolecules, with an emphasis on proteins and nucleic acids. Metabolic processes involved in energy production, storage and transformation will be studied. Biochemical signaling and biological membranes will also be covered. There will be an overview of modern biochemical experimental methods.

Offered: Fall 2022-2023

Requisites: Prereq: SC226.

Course: SC336

Title: BIOCHEMISTRY II

Credits: 3-0-3

Description: This course will expand and build on topics from SC335, such as biomolecular structure, bioenergetics and enzyme kinetics, to cover biosynthesis of amino acids, nucleotides and cofactors; photosynthesis and plant metabolic cycles; signal transduction; molecular genetics; regulation of eukaryotic and prokaryotic gene expression.

Offered: Spring

Requisites: Prereq: SC335.

Course: SC338

Title: MOLECULAR & GENERAL GENETICS

Credits: 3-0-3

Description: Students in this course will study the inheritance of traits, starting with basic (Mendelian) genetics and ending with modern molecular biology. The course will examine incomplete dominance, epistasis, pleiotropy, transformation, cloning, genetic engineering, imprinting, and experimental techniques. Co-listed as SB338.

Offered: Spring

Requisites: Prereq: SB251 or SC335.

Course: SC341

Title: CHEM ENGINEERING PROCESSES

Credits: 3-0-3

Description: An introductory course designed to prepare students to analyze material and energy balances relative to chemical processes utilizing the engineering approach for problem-solving.

Offered: Fall

Requisites: Prereq: SC112, SP212, SM221, SC262 or approval of department chair

Course: SC345

Title: PHYSICAL CHEMISTRY I

Credits: 3-0-3

Description: This course explores physical and chemical phenomena with an emphasis on thermodynamics. An introduction to kinetics is included.

Offered: Fall 2022-2023

Requisites: Prereq: (SC112 or SC151), SP211 and SM212 or Dept Chair approval.

Course: SC346

Title: PHYSICAL CHEMISTRY II

Credits: 3-0-3

Description: A continuation of SC345, with an emphasis on the quantum theory of atomic and molecular structure including spectroscopy.

Offered: Spring

Requisites: Prereq: SC345 and SM212 or Dept Chair approval.

Course: SC351

Title: CHEMICAL STRUCTURE BY X-RAYS

Credits: 2-2-3

Description: X-ray diffraction is the most powerful tool for determining the three-dimensional structures of molecules. This course is a practical, hands-on, introduction to modern methods of 3D molecular structure determination by X-ray diffraction. Students will learn the basics of the technique from crystal growth to final structure solution.

Offered: Spring

Requisites: Prereq: SC112 and SM212.

Course: SC356

Title: INORGANIC CHEMISTRY

Credits: 4-0-4

Description: The chemistry of the Main Group elements and the transition metals are studied with emphasis on the properties, structures, and reactivities of these elements and their compounds.

Offered: Spring

Requisites: Prereq: SC226 and SC345.

Course: SC361

Title: INTEGRATED LAB III

Credits: 1-6-3

Description: The course Integrated Lab III - Physical Principles and Quantitative Analysis examines the theory and behavior of molecules and ions in solution. These are studied in the laboratory by classical and modern instrumental methods of analysis. Quantitative laboratory techniques are stressed and sampling techniques and statistical analysis of data are introduced. Experimental design and application of analytical methods to real systems is emphasized. Students apply these techniques in a laboratory analysis of their own design.

Offered: Fall 2022-2023

Requisites: Prereq: SC262 and SC216; Coreq: SC345 unless waived by department chair.

Course: SC364

Title: INTEGRATED LAB IV - ADVANCED LAB AND SEMINAR

Credits: 1-6-3

Description: This laboratory course emphasizes the theory, structure, synthesis and characterization of inorganic and organometallic compounds through application of a number of advanced techniques. Advanced synthetic methods include photochemical, high temperature and inert-atmosphere reactions. Advanced analytical methods include magnetic susceptibility measurements, EPR, Raman and high-resolution, gas-phase spectroscopy and fast reaction (stopped-flow) kinetics. In addition, a weekly seminar that includes discussions and presentations by faculty, student and distinguished visitors provides exposure to the wide-ranging scope of chemistry.

Offered: Spring

Requisites: Prereq: SC361 Coreq: SC346 and SC356 unless waived by department chair.

Course: SC412

Title: ENVIRONMENTAL CHEMISTRY

Credits: 3-0-3

Description: Many analytical chemistry techniques can be used to learn more about the chemistry of our environment. In this course students will be exposed to specific applications of these techniques to various environmental systems (i.e. water, air, soil, etc.). Topics to be explored may include the bio- and geo-chemical cycles, the effect of military activities on the environment and the use of "green chemistry" in industry.

Offered: Fall 2022-2023

Requisites: Prereq: SC216 or approval of department chair

Course: SC416

Title: ANALYTICAL CHEM IN FORENSICS

Credits: 3-0-3

Description: This course will address the types of sample collection techniques used in criminal investigations, as well as the chemical and instrumental methods used to determine the presence of substances associated with illicit activities. Emphasis will be placed on specific forensic investigative techniques such as DNA fingerprinting, drug detection, arson investigations (petroleum residues), bombings (explosives residues) and characterization of fibers and paint.

Offered: Spring

Requisites: Prereq: SC361.

Course: SC421

Title: POLYMER CHEMISTRY

Credits: 2-2-3

Description: The synthesis, characterization and physical chemistry of macromolecules, both man-made and natural, will be presented with the ultimate goal of understanding the relationship between molecular structure and physical properties. Polymer processing, fabrication and recent novel applications, including those related to the Navy, will be presented. Field trips to local polymer research and manufacturing facilities are planned.

Offered: Spring

Requisites: Prereq: SC226 and SC264.

Course: SC425

Title: MEDICINAL CHEMISTRY

Credits: 2-2-3

Description: This course will provide a foundation in how pharmacologically active compounds (drugs) work, explore various classes of pharmaceuticals and how they are discovered and review some of the state-of-the-art research being carried out by the military to maximize combat effectiveness. Selected topics will be explored in the laboratory

Offered: Fall

Requisites: Prereq: SC226 and SC335.

Course: SC431

Title: MICROBIAL CHEMISTRY

Credits: 2-2-3

Description: This course will explore the interactions that occur between microbes and their surroundings, including human hosts and extreme environments. Species of these "simple" organisms have evolved diverse mechanisms to combat assault by antibiotics, heavy metals, pollutants and extreme irradiation. The lab component of the class will include identifying, cultivating and testing organisms with survival mechanisms of interest. Co-listed as SB431.

Offered: Fall

Requisites: Prereq: SB251 and SC335.

Course: SC435

Title: BIOPHYSICAL CHEMISTRY

Credits: 3-0-3

Description: Phenomena such as ligand binding, protein and nucleic acid folding and structure, biomolecular motion, and membrane structure and function will be studied by examining the intermolecular forces, kinetics and thermodynamics that govern them. Relevant experimental techniques will also be discussed.

Offered: Spring

Requisites: Prereq: SC335 and SC345.

Course: SC442

Title: PROPELLANTS AND EXPLOSIVES

Credits: 2-2-3

Description: This course will delve into the structural, physical, and chemical properties of energetic materials. Students will investigate the application of energetic materials to military and civilian uses and will explore methods and processes to detect and characterize energetic materials both before and after use. Laboratory experiments investigating energetic materials and their applications are planned.

Offered: Spring

Requisites: Prereq: SC226, SC345.

Course: SC446

Title: QUANTUM CHEMISTRY

Credits: 3-0-3

Description: The principles of quantum mechanics are reviewed and used to develop molecular orbital theory which is applied to the structure and properties of molecules. Modern quantum chemistry software will be used for electronic structure calculations.

Offered: Spring

Requisites: Prereq: SC346.

Course: SC451

Title: BIOINORGANIC CHEMISTRY

Credits: 3-0-3

Description: Life is inorganic, too. Every breath uses the iron protein, hemoglobin, and every step is supported by bone made of calcium salts and driven by phosphate containing molecules such as ATP. This course will shed light on the structure and function of these bioinorganic compounds using a host of techniques such as X-ray diffraction and NMR spectroscopy.

Offered: Fall

Requisites: Prereq: SC335 and SC356 or permission of the department chair.

Course: SC472

Title: CHEMISTRY SEMINAR

Credits: 1-0-1

Description: 1/C Chemistry majors meet weekly to discuss ongoing research projects. Each student pursuing a research project will be expected to make a seminar presentation. Other seminar speakers may include department faculty members and researchers from outside the Academy.

Offered: Spring

Requisites: Prereq: 1/C SCH major.

Course: SC476

Title: CAPSTONE PROJECT

Credits: 0-6-3

Description: Under the guidance of a faculty member, students in this course undertake projects that require them to bring together and apply multiple aspects of their chemistry education. Oral and written progress reports are required at the end of the semester.

Offered: Fall, Spring

Requisites: Prereq: 1/C SCH major.

Computer Science Department Courses (IC, IT, SD, SI)

Course: IC210

Title: INTRO TO COMPUTING

Credits: 3-2-4

Description: Introduction to algorithmic development, problem solving and software design. Principles and concepts to provide foundational knowledge and experience upon which later computing courses will build. This is the first course for computer science and information technology majors.

Offered: Fall 2022-2023

Requisites: Prereq: None.

Course: IC211

Title: OBJECT ORIENTED PROGRAMMING

Credits: 2-2-3

Description: This course builds on the procedural programming skills developed in the prerequisite course and introduces the student to object oriented programming and design principles using Java. Object oriented topics such as classes, inheritance, information hiding, polymorphism and dynamic binding are presented and used to create robust, reusable, and maintainable software. The fundamentals of Java are presented along with exception handling, I/O, event driven programming, simple GUIs and generics.

Offered: Summer 2022-2023

Requisites: Prereq: IC210, SI204, or SY204.

Course: IC220

Title: COMPUTER ARCHITECTURE & ORG

Credits: 3-0-3

Description: This course introduces students to performance metrics, instruction set architectures, assembly language, logic design, memory hierarchies, and pipelining.

Offered: Spring

Requisites: Prereq: IC210 or SI204 or permission of department chair.

Course: IC221

Title: SYSTEMS PROGRAMMING

Credits: 2-2-3

Description: The study of an application's interface with the operating system. The operating system is treated as an information resource, and as a facilitator for information flow between processes, including those executing on separate machines. Topics include: process management, multiprogramming, and the basic concepts necessary to understand the design and operation of computer communication networks.

Offered: Spring

Requisites: Prereq: (IC210 or SI204 or permission of department chair); Coreq: IC220.

Course: IC312

Title: DATA STRUCTURES

Credits: 3-0-3

Description: This course examines abstract data types (ADT), data structures, data representation and information management including storage structures, allocation and collection. ADTs and data structures presented include lists, stacks, queues, trees, heaps, priority queues, maps, dictionaries and graphs. Sorting and searching techniques, hashing and graph algorithm analysis are also covered.

Offered: Summer 2022-2023, Fall 2022-2023

Requisites: Prereq: (IC211 or permission of department chair); Coreq: SM242.

Course: IC322

Title: COMPUTER NETWORKS

Credits: 2-2-3

Description: The course presents the fundamental theoretical concepts, characteristics and principles of computer communications and computer networks, and analyzes and assesses these foundational concepts with respect to network performance and network design.

Offered: Fall 2022-2023

Requisites: Prereq: (IC221 or SY204); Coreq: (SM242 or equivalent); or permission of department chair.

Course: IC411

Title: OPERATING SYSTEMS

Credits: 3-0-3

Description: The study of the operating system as a resource manager. Topics include process management, interrupt processing, memory management, deadlock handling, file systems, multiprogramming, multiprocessing, data security and protection.

Offered: Fall 2022-2023

Requisites: Pre: (IC220 or SY303), (IC221 or SY204), and (IC312 or SY301).

Course: IC470

Title: SOFTWARE ENGINEERING

Credits: 2-2-3

Description: An introduction to the basic principles of software engineering.

Offered: Fall 2022-2023

Requisites: Prereq: IC312.

Course: IC480

Title: RESEARCH SEMINAR/CAPSTONE

Credits: 1-4-3

Description: This is a capstone course that ties together concepts from the information technology and computer science curriculums to solve a practical problem. These team-oriented project solutions will include the requirements gathering, analysis, design and development of a computing system involving a large, multi-layer organization using appropriate information management and computing technologies.

Offered: Fall 2022-2023

Requisites: Prereq: IT470 or Chair Permission.

Course: IT350

Title: WEB & INTERNET PROGRAMMING

Credits: 2-2-3

Description: Web site design and management, clients and servers, client and server side scripting languages, web transmission protocols.

Offered: Fall 2022-2023

Requisites: Prereq: IC210.

Course: IT360

Title: APPLIED DATABASE SYSTEMS

Credits: 2-2-3

Description: This course introduces the principles underlying Database Management Systems (DBMS) with a special emphasis on database management system structure and function when integrated with web-based database applications.

Offered: Spring

Requisites: Prereq: IC312 and IT350.

Course: IT430

Title: COMPUTER AND NETWORK SECURITY

Credits: 2-2-3

Description: This course is an introduction to the theoretical and practical facets of Information Assurance (IA) to include: Department of Defense (DoD)/Department of the Navy (DoN) policies and directives, Trusted systems, Access mediation, Cryptography, Public Key Infrastructure (PKI), Information Warfare, Network security and Database security. Laboratory work will include student exercises demonstrating information assurance concepts culminating in a vulnerability analysis of given systems.

Offered: Spring

Requisites: Prereq: IC322 or IT340.

Course: IT432

Title: ADVANCED COMPUTER AND NETWORK SECURITY

Credits: 2-2-3

Description: This course provides an introduction to topics in secure system design, including: cryptography, operating system security, and language based security. Where the IT430 course focuses primarily on securing an existing system, this course studies how to design a system to meet security goals. Students will design and implement components of a secure system.

Offered: Fall 2022-2023

Requisites: Prereq: IT430 or permission of department chair.

Course: IT452

Title: ADV WEB & INTERNET SYSTEMS

Credits: 2-2-3

Description: Web server design and configuration, search engine design and usage, web security and authentication, servlet implementations, web collaboration mechanisms, web services, and knowledge representation on the web.

Offered: Fall, Spring

Requisites: Prereq: IT350 or SY306.

Course: IT460

Title: HUMAN COMPUTER INTERACTION

Credits: 2-2-3

Description: An introductory course emphasizing interactive software design, development and evaluation using a human-centered approach. Topics include aspects of human sensation, perception and cognitive psychology.

Offered: Fall, Spring

Requisites: Prereq: IC312 or IT350.

Course: IT470

Title: ENTERPRISE COMPUTING

Credits: 2-2-3

Description: This course develops architectures and concepts for the development of multi-tier (typically 3 tiered) distributed applications for an entire organization or enterprise. This includes a user interface called the client tier or tier 1, a server component which is controlled by the organization and provides for interaction with and data collection from the user (tier 2) and a database component that stores transactions and updates client profiles (tier 3). The course teaches advanced techniques for network programming as well as server management and programming.

Offered: Fall, Spring

Requisites: Prereq: (IC322 or IT340) and (IT360 or IT420).

Course: IT472

Title: MOBILE OS DEVELOPMENT

Credits: 2-2-3

Description: This course introduces students to software development for mobile operating systems. Focusing primarily on the use of Java and XML, student will apply object oriented programming and design principles in the development of mobile applications for the Android operating system. Topics include application life-cycle, user interface design, event-handling, threads, network communication and mobile security.

Offered:

Requisites: Prereq: IC211

Course: SD211

Title: DATA SCIENCE & PROGRAMMING I

Credits: 3-2-4

Description: Introduction to computer programming for the purpose of implementing solutions relating to data acquisition, storage, processing, analysis, and visualization. The concepts provide foundational knowledge and experience upon which later data science courses will build. This is the first course for data science majors. Credit will not be given for both SD211 and any of: SY201, SI268.

Offered: Fall 2022-2023

Requisites:

Course: SD212

Title: DATA SCIENCE & PROGRAMMING II

Credits: 3-2-4

Description: This course builds on the programming skills developed in the prerequisite course and moves the focus towards a wider software ecosystem in order to solve more complex data science tasks. Students will learn and apply foundational principles of program organization including classes and objects, interfaces, inheritance, abstraction, and decoupling. In addition, important command-line skills will be developed for data gathering and cleaning, as well as library and software acquisition and use. These principles will be utilized through high-level programming in Python to analyze and manipulate real-world data sets.

Offered:

Requisites: Prereq: SD211

Course: SD311

Title: DATA STRUCTURES & SCALABILITY

Credits: 3-0-3

Description: This course is an examination of computational efficiency in representing and computing with large data sets. Students will become familiar with the use and performance characteristics of common data structures including stacks, queues, lists, trees, heaps, and hash tables. The techniques of asymptotic analysis using big-O notation will be introduced as a formal tool to understanding how computer programs scale in resource use for increasingly large inputs. A strong emphasis will be placed on developing the ability to choose the most appropriate data structures for a given computational task, and to roughly estimate the asymptotic complexity of programs with loops and nested function calls. Credit will not be given for SD311 and any of: SY301 and IC312.

Offered:

Requisites: Prereq: SD211

Course: SD312

Title: MACHINE LEARNING

Credits: 2-2-3

Description: This course is intended to take the student beyond linear regression and classification models as taught in SM317. Subjects include learning theory, unsupervised learning, recommendation systems, reinforcement learning, and neural networks. Credit will not be given for both SD312 and SI470.

Offered:

Requisites: Prereq: SM317, SD311 or SI312

Course: SD321

Title: DATA STORAGE

Credits: 2-2-3

Description: This course provides students with an introduction to data storage methods and systems. Topics include hardware and software used to efficiently store large datasets, relational databases and data models, SQL, and applications that interact with databases.

Offered:

Requisites: Prereq: SD212 Coreq: SD311 or permission of the Dept Chair

Course: SD322

Title: HUMAN DATA INTERACTION

Credits: 2-2-3

Description: Studies the intersection of people and data. This course covers technical concepts relating to how humans interact with data interfaces and visualizations, as well as ethical questions of how humans interpret, present, and ultimately deploy data science tools.

Offered:

Requisites: Prereq: SD311

Course: SD411

Title: BIG DATA COMPUTING

Credits: 3-0-3

Description: This course focuses on processing large datasets in a distributed environment, including cloud systems and High Performance Computer Centers. Topics include NoSQL systems, MapReduce, cloud architecture, and distributed frameworks. Students will gain familiarity using DoD cloud computing resources.

Offered:

Requisites: Prereq: SD321 or permission of Dept Chair.

Course: SD475

Title: DATA SCIENCE CAPSTONE

Credits: 2-2-3

Description: This course is a capstone course for the Data Science major. Students will read and make presentations on topics determined by the instructor. Each student will complete a project on a topic to be agreed upon by the instructor and student. Students will present their results in writing and orally.

Offered:

Requisites: Prereq: 1C SDS major or permission of Dept Chair.

Course: SI200

Title: INFORMATION TECH FOR THE JO

Credits: 3-2-4

Description: This is a hands-on lab course introducing computer programming and database management. Topics include: web programming using HTML and XHTML, structured and object oriented computer programming using a scripting language (such as JavaScript) or 4th Generation Language (such as Java or C++), and designing, implementing, and querying databases using a Database Management System (such as Access or SQL Server). The course includes a series of Internet computing and programming projects of increasing complexity. No prior knowledge of databases, web programming, or computer programming is assumed. Students may not receive credit for this course and SI250. It may not count as a SCS major elective and IT majors cannot take this course.

Offered: Fall

Requisites: Prereq: None.

Course: SI204

Title: INTRO TO COMPUTER SCIENCE

Credits: 3-2-4

Description: Introduction to algorithmic development, problem solving and software design. Principles and concepts to provide foundational knowledge and experience upon which later computer science courses will build.

Offered: Spring

Requisites: Prereq: None.

Course: SI221

Title: DATA STRUCTURES

Credits: 2-2-3

Description: Data representation and information management. Dynamic memory, recursion, lists, stacks and queues. Storage structures, allocation and manipulation.

Offered: Fall 2022-2023

Requisites: Prereq: SI204.

Course: SI242

Title: DISCRETE STRUCTURES FOR COMPUTING

Credits: 2-2-3

Description: An introduction to mathematical tools and concepts necessary for designing and understanding computer software and systems: truth tables, propositional and predicate logic, basic number theory, proof techniques, sequences, induction, recurrences, and basic linear algebra. Labs will involve hands-on activities to demonstrate, test, and explore the mathematical topics of the class through computer tools such as SAT solvers, modular arithmetic libraries, and recursive programs. Cannot receive credit for SI242 and (SM242 or SM342).

Offered: Fall 2022-2023

Requisites: Prereq: SM122 or SM162. Coreq: IC210 or SI204.

Course: SI268

Title: PROGRAMMING FOR EVERYONE

Credits: 2-2-3

Description: This hands-on course introduces computer programming to a general audience using Python. Students will learn basic programming skills they will be able to apply to a variety of disciplines, including social sciences, humanities, science, and engineering. Credit will not be given for SI268 and SY201.

Offered:

Requisites:

Course: SI335

Title: COMPUTER ALGORITHMS

Credits: 3-0-3

Description: Presents techniques for designing and analyzing computer algorithms including divide and conquer, dynamic programming and greedy methods. Introduces classic algorithms for problems such as searching and sorting, graph analysis, file compression and cryptology.

Offered: Spring

Requisites: Prereq: SI340 and (IC312 or SY301).

Course: SI340

Title: THEORY OF COMPUTING

Credits: 3-0-3

Description: This course presents the theoretical foundations for computing, including the study of formal languages, finite state machines, pushdown automata, Turing machines and computability.

Offered: Fall 2022-2023

Requisites: Prereq: IC210, SI204, or SY201; Coreq: SM242 (or equivalent).

Course: SI342

Title: THEORY OF COMPUTING

Credits: 4-0-4

Description: This course presents the theoretical foundations for computing, including basic set theory, predicate logic, formal languages, finite state machines, pushdown automata, Turing machines and computability. Cannot receive credit for both SI342 and SI340.

Offered:

Requisites: Prereq: IC210 or SI204. Coreq: SI242.

Course: SI413

Title: PROGRAMMING LANGUAGES

Credits: 2-2-3

Description: This course examines basic concepts underlying the design of modern programming languages: types, control structures, abstraction mechanisms, inheritance, concurrency and constructs for programming. This course will include programming assignments in several languages.

Offered: Fall 2022-2023

Requisites: Prereq: SI340 and (IC312 or SY301).

Course: SI420

Title: ARTIFICIAL INTELLIGENCE

Credits: 3-0-3

Description: A study of the fundamental concepts and techniques in the design and implementation of functionally intelligent machines. Topics include problem-solving using state-space search, game trees, state and plan space planning, and machine learning.

Offered: Fall, Spring

Requisites: Prereq: (IC312 or SY301) and (SM242 or equivalent) and IC211 (or instructor approval).

Course: SI425

Title: NATURAL LANGUAGE PROCESSING

Credits: 2-2-3

Description: This course covers topics for the machine understanding of human languages. Can computer automatically understand languages like English? Both the intelligence community and the private sector are increasingly interested in mining huge amounts of written text for information. The course will cover algorithms to both learn and interpret language. Using hands-on laboratory assignments, topics will include author identification, language modeling, information retrieval from huge datasets, email filtering, syntactic parsing, and sentiment analysis.

Offered:

Requisites: Prereq: IC312

Course: SI436

Title: DISTRIBUTED SYSTEMS

Credits: 3-0-3

Description: Distributed systems are software systems built on networked architectures, where multiple machines are interconnected by local or wide-area networks. Many currently deployed systems are distributed systems of one type or another, including internet services and control systems used in military applications. This course will provide an in-depth introduction to distributed systems, including their characteristics and challenges, various fundamental structuring paradigms that can simplify the construction of distributed software, and analyze example systems.

Offered:

Requisites: Prereqs: IC211, IC220, and IC221.

Course: SI440

Title: DATABASE SYSTEMS

Credits: 3-0-3

Description: This course offers an introduction to modern database management systems. Concepts covered include relational model, schema design, SQL, query optimization, concurrency control, and recovery. The course focuses on the design and internals of modern database systems.

Offered: Fall, Spring

Requisites: Prereq: IC312.

Course: SI455

Title: ADVANCED COMPUTER NETWORKS

Credits: 3-0-3

Description: This course provides an in-depth technical study of high-speed networking, client-server programming and applications, network firewall architectures and security procedures, and the ATM network.

Offered: Spring

Requisites: Prereq: IC322.

Course: SI458

Title: HIGH PERFORMANCE COMPUTING

Credits: 2-2-3

Description: A supercomputer is generally defined as a system that performs at or near the highest speed for currently available computers. High Performance Computing (HPC), is the use of parallel processing in supercomputers or similar systems for running computationally-intensive application programs. The emphasis is on efficiency at every level for optimum speed of execution. In this course, we will look at the current state of the HPC art, study the techniques used for parallel programming - using cores, nodes, and even GPUs for maximum processing power. We will write some simulations to use these HPC techniques, run the simulations on our own HPC system, and produce visualizations of the resulting data.

Offered:

Requisites: Prereq: IC312 or SY301.

Course: SI459

Title: BINARY ANALYSIS & EXPLOITATION

Credits: 2-2-3

Description: In this course, midshipmen study in detail how programs execute at the binary level. They gain a better understanding of the compilation process and how high-level source code is mapped to binary machine code. They learn about memory organization on the stack and the heap, analyze binary executable files, learn about operating system projections, and gain an understanding of the binary exploit development process.

Offered:

Requisites: Pre-reqs: IC220, IC221.

Course: SI460

Title: COMPUTER GRAPHICS

Credits: 2-2-3

Description: A project-based course involving basic concepts, theories and algorithms associated with producing 2D and 3D images on a raster display. Topics include graphics primitives, modeling, viewing, illumination, shading, texture, and event-driven programming using a graphics API.

Offered: Fall 2022-2023

Requisites: Prereq: IC312.

Course: SI475

Title: INTELLIGENT ROBOTICS

Credits: 2-2-3

Description: This course presents a survey of the concepts and theories of modern robot systems, including both manipulators and mobile robots. It covers kinematics, sensing, mapping and navigation, decision making, and learning. Concepts are applied on multiple robotic platforms.

Offered: Spring

Requisites: Prereq: IC211 and (IC312 or SY301).

Cyber Science Department Courses (SY)

Course: SY110

Title: CYBER SECURITY I

Credits: 2-2-3

Description: Introduction to Cyber Security is a hands-on lab-based course providing a technically focused introduction to the principles behind the use, function, and operation of computers, networks and applications with an emphasis on cyber security.

Offered: Fall 2022-2023

Requisites:

Course: SY201

Title: CYBER FUNDAMENTALS I

Credits: 3-2-4

Description: This course will teach students problem solving skills in cyber-operations domain using the Python programming language on a Linux platform. Students will analyze the current cyber warfare threats and problems, and code Python programs to solve some of these and related problems.

Offered: Fall 2022-2023

Requisites: Prereq: SY110 & SCY major.

Course: SY202

Title: CYBER SYSTEMS ENGINEERING

Credits: 2-2-3

Description: An introductory practicum that emphasizes interconnected cyber-physical systems, communications between those systems, the controls and the associated space in which these relationships exist. The student will demonstrate that cyberspace is a domain within the information and electromagnetic environment consisting of the interdependent network of information technology infrastructure, including the Internet, telecommunications networks, computer systems, and embedded processors and control systems. The theme of this course is for the student to understand that entire communication cycle as it pertains to the cyber physical and communications controls systems.

Offered:

Requisites: Prerequisites: SY201, SM223, SP211

Course: SY204

Title: SYSTEMS PROGRAMMING & OS FUNDAMENTALS

Credits: 3-2-4

Description: Students will expand their programming expertise through the exploration of systems level programming utilizing C. Additionally, students will learn the fundamental features and design of operating systems. The activities in the course will be covered from a cyber operations perspective.

Offered:

Requisites: Prereq: SY201

Course: SY205

Title: NETWORKING: OPS AND ANALYSIS

Credits: 0-4-2

Description: In this course, students learn and practice information system networking through hands-on analysis. Students utilize various tools to capture and analyze network traffic. Students build wired networks, and set up and configure hardware and software. Students explore the OSI and TCP/IP stacks by analyzing protocols in operation, focusing on the Data Link Layer and up. Students are introduced to number systems, and command line interfaces. Credit will not be given for both SY205 and IC322.

Offered: Fall 2022-2023

Requisites: Prereq: SY110 and SCYN major Coreq: ES200, SY201, IC210, SI204

Course: SY301

Title: DATA STRUCTURES FOR CYBER OPERATIONS

Credits: 3-2-4

Description: This course will cover the usual Data Structures topics, with a focus on cyber-operations. Students will learn how complex data are represented in computer programs and how the implementation/interface distinction helps enable it. They will learn the most common abstract data types and the standard implementations of them. They will explore how complexity in representation enables more sophisticated software, but also creates complex vulnerabilities. Examples will segue into the Web and Database course.

Offered: Summer 2022-2023, Fall 2022-2023

Requisites: Prereq: SY204.

Course: SY303

Title: CYBER SYSTEMS ARCHITECTURE

Credits: 3-2-4

Description: A simple yet functional computer will be designed and implemented using NAND gates and D Flip-Flops. In this project-oriented course, groups will collaborate on each component of this modular system design. A hardware description language will be used to describe the sequential and combinational logic needed to implement each module. Then the computer will be prepared to accept high-level object-oriented programs through the designs of an assembler, a virtual machine, and a compiler. Finally, a basic operating system will be designed to allow easy interfacing with the underlying hardware. As time permits, a final project will address a security concern in the overall system or utilize the system to implement an existing security algorithm.

Offered: Fall 2022-2023

Requisites: Prereq: SY204.

Course: SY304

Title: HUMAN FACTORS IN CYBER OPERATIONS

Credits: 3-0-3

Description: This course will examine the "human factor" of cyber operations, the role of individuals and groups as a factor in cyber operations, with a focus on the use of social engineering techniques and non-standard approaches used to gain an advantage (technologically, militarily, economically, intellectually) in the cyber domain. Social Engineering is the art of exploiting human psychology to gain access to buildings, systems, or data, and is evolving such that technology solutions, security policies, and operational procedures alone cannot protect resources. In many cases, individuals prove to be the largest vulnerability in a network, cyber practitioners need to understand how to effectively defend against or exploit such vulnerabilities.

Offered: Fall 2022-2023

Requisites: Prereq: SCY major

Course: SY306

Title: WEB AND DATABASES FOR CYBER OPERATIONS

Credits: 2-2-3

Description: The course covers basic web-based application development with a database back-end, with a focus on security. Topics include client side and server side web applications development, the SQL language for relational databases, web authentication, secure web protocols, attack and defense of web-based applications with a database back-end.

Offered:

Requisites: Prereq: SY301

Course: SY308

Title: SECURITY FUNDAMENTAL PRINCIPLES

Credits: 3-0-3

Description: This course will cover the fundamental principles in security: cryptography, identity, and access control. Topics will include symmetric encryption, public key encryption, RSA, Steganography, man-in-the-middle attacks, digital signatures, JVM and signed code, open SSL, block cypher modes, hashing, white and black lists, X.509 certificates, CAC cards, challenge/response authentication, multi-factor authentication, password cracking, salt, replay attacks, and message authentication codes.

Offered:

Requisites: Prereq: SY202

Course: SY310

Title: INTRO TO NETWORKING & WIRELESS COMMUNICATIONS

Credits: 3-2-4

Description: An introduction to wired and wireless communications and associated vulnerabilities at the physical, data link and network layers of the TCP/IP model. The theme of this course is for the student to understand the entire communication cycle as it pertains to wired and wireless computer networks and communications systems. Beginning with electromagnetic spectrum and the fundamentals that govern its use, each student will learn the unique implications of operating in a wireless environment. The student will demonstrate applications of interdependent networks, including the Internet and telecommunications networks within the cyberspace domain. Additionally, the student will understand electronic engineering and tactics in support of spectrum dominance and retaining strategic advantage to open and closed networks.

Offered: Spring

Requisites: Prereq: SI110, SM224, and SP212.

Course: SY312

Title: WIRELESS COMMS: PRINC & NETS

Credits: 3-2-4

Description: Students will learn the entire communication cycle as it pertains to wireless communication systems. Beginning with the electromagnetic spectrum and the fundamentals that govern its use, each student will learn the unique implications of operating in a wireless environment to include current implementation of wireless networks and associated modern technologies. Throughout the course, students will explore and analyze the inherent cyber vulnerabilities of wireless communications and appropriate defensive security procedures for modern wireless networks. Credit will not be given for both SY312 and SY310.

Offered:

Requisites: Prereq: SY110, SY205 Coreq: SY308

Course: SY401

Title: CYBER OPERATIONS I

Credits: 2-2-3

Description: This course will be part I of a two-part course during senior year, during which all aspects of Cyber Operations and course work up to this point will be used to adequately defend or attack a "Cyber City". This simulated cyber environment will pose multiple technical and non-technical challenges in a holistic approach to cyber operations across the spectrum.

Offered: Fall 2022-2023

Requisites: Prereqs: SY304 & SY308

Course: SY402

Title: CYBER OPERATIONS II

Credits: 2-2-3

Description: This course will be the second part of a two-part course during senior year, during which all aspects of Cyber Operations and course work up to this point will be used to adequately defend or attack a "Cyber City". This simulated cyber environment will pose multiple technical and non-technical challenges in a holistic approach to cyber operations across the spectrum.

Offered:

Requisites: Prereq: SY401

Course: SY403

Title: CYBER PLANNING & POLICY

Credits: 3-0-3

Description: A growing dependence on military and intelligence networks and the networking of our critical national infrastructure can quickly become vulnerabilities. This course will develop a political and economic framework for analyzing cyber power. The course will cover the body of thought that impinges on cyber matters and provides a synthesis of this information in a variety of decision-making contexts.

Offered: Fall 2022-2023

Requisites: Prereq: FP130

Course: SY406

Title: CYBER LAW & ETHICS

Credits: 3-0-3

Description: This course examines legal and ethical challenges that cyber operations professionals confront in the public and private sectors. The course begins with an in-depth review of the provisions of the United States Constitution that shape the cyber operations of the military and civilian government agencies. The course then reviews the statutes and regulations that provide the government with the authority to conduct cyber operations, as well as the limits that the statutes impose. The course examines the interplay between public-sector and private sector cybersecurity efforts, and the state and federal laws that regulate private-sector cybersecurity. We also explore the ethical considerations that apply to cyber operations. Counts for upper level Humanities and Social Science credit.

Offered:

Requisites: Prereq: NE203.

Course: SY416

Title: SOFTWARE REVERSE ENGINEERING

Credits: 2-2-3

Description: Students will learn why software is reverse engineered and the fundamentals of how it's done. Fundamental topics will be introduced: compilers, linkers, loaders, assembly language, as well as static and dynamic analysis tools. Hands on work will develop the skills and knowledge used to reverse engineer a binary. We begin by discussing computer architecture, the evolution of programming from assembly language to modern languages, as well as the fundamentals of compilation. We then apply this knowledge while learning about static and dynamic analysis tools used to reverse engineer software. Students will reverse engineer representative examples of software, including malware.

Offered:

Requisites: Prereq: SY303 or IC220 or EC362

Course: SY418

Title: MODERN DIGITAL FORENSICS

Credits: 2-2-3

Description: A hands-on multidisciplinary course where students will learn and perform digital, mobile, and network forensics using modern hardware and software forensic tools, as well as be introduced to the legal aspects of forensics and how they are intertwined with technology.

Offered: Fall 2022-2023

Requisites: Prereq: SY301, SY303, or permission of the Dept Chair.

Course: SY419

Title: FREE SPEECH IN CYBERSPACE

Credits: 3-0-3

Description: This course examines how free speech law has shaped cyberspace. We will look at constitutional and statutory protections on free speech in the United States, and examine the role that platforms play in enabling free speech. The topics covered include the First Amendment as applied to the Internet, intermediary liability protections such as Section 230, legal protections for online anonymity, and copyright protections for online content.

Offered:

Requisites: Prereq: FP130.

Course: SY441

Title: ESPIONAGE IN THE CYBER AGE

Credits: 3-0-3

Description: Espionage, as a practice, has changed dramatically over time and continues to evolve alongside social, political, and technological transformations. In this course, we examine and analyze the interdisciplinary topic of cyber espionage and

explore the manifold ways that espionage and the cyber domain have affected each other. This is a reading-intensive course that includes a term paper. Through a variety of publications and scholarly journals, students will gain the background knowledge required to critically think, discuss, argue, and write on topics relating to espionage practices and cyber operations.

Offered:

Requisites: Prereq: 2/C standing or higher

Mathematics Department Courses (SA, SM)

Course: SA233

Title: INTRO TO OPERATIONS RESEARCH WITH PROGRAMMING

Credits: 2-2-3

Description: This course introduces students to several fundamental topics in operations research. Each topic will be implemented in Python. Credit will not be given for SA233 and SI268 or SY201.

Offered: Fall 2022-2023

Requisites: Prereq: SMO major or permission of the Dept Chair. Coreq: SM261.

Course: SA302

Title: ANALYSIS OF NAVAL TACTICS

Credits: 3-2-4

Description: An introduction to the techniques of modeling and quantitative analysis applied to specific naval operational problems, including search and patrol, screening, anti-air warfare, mining, equipment reliability and decision rules. Does not count as a major elective for Mathematics majors. Credit cannot be given for both SA302 and SA410.

Offered: Fall, Spring

Requisites: Prereq: SM219, SM239 or SM230.

Course: SA305

Title: LINEAR PROGRAMMING

Credits: 3-0-3

Description: An introduction to linear programming. Topics include: extensive linear programming modeling techniques, the Simplex method, sensitivity analysis, and basic linear programming theory. Midshipmen cannot receive credit for both SA305 and SA401.

Offered: Spring

Requisites: Prereq: SM261 or permission of department chair.

Course: SA367

Title: INTRODUCTION TO MATHEMATICAL MODELING

Credits: 3-0-3

Description: Realistic problems, often of military interest, are formulated mathematically and solved using techniques from probability, statistics, calculus and differential equations. The analysis is carried out by students working in small teams and individually. Solutions are presented in oral nontechnical briefings and in written technical reports.

Offered: Fall

Requisites: Prereq: SM219, SM239 or SM230.

Course: SA402

Title: DYNAMIC & STOCHASTIC MODELS

Credits: 3-0-3

Description: Investigation of quantitative analysis of decision options, including dynamic programming, decision trees, Markov chains and queuing theory. Applications to typical operations are stressed.

Offered: Fall 2022-2023

Requisites: Prereq: (SM239 or SM230) and SM261.

Course: SA403

Title: GRAPH AND NETWORK ALGORITHMS

Credits: 3-0-3

Description: This course introduces graph algorithms for problems in network and combinatorial optimization. Topics include: minimum spanning trees, matchings, shortest paths, maximum flows and minimum cost flows. Students will also be expected to program algorithms on a computer.

Offered: Spring

Requisites: Prereq: SM233 or permission of department chair.

Course: SA405

Title: ADVANCED MATH PROGRAMMING

Credits: 3-0-3

Description: This course covers a range of advanced topics in mathematical programming. Topics include integer programming modeling, branch-and-bound methods, integer programming theory and nonlinear optimization theory and algorithms. Students will also learn to use a set-based modeling language for an advanced integer programming solver. Topics will vary with instructor.

Offered: Fall 2022-2023

Requisites: Prereq: SA305 or permission of department chair.

Course: SA410

Title: APPLICATIONS OF SEARCH AND DETECTION THEORY

Credits: 3-0-3

Description: Considerations in picking a measure of effectiveness (MOE) for use in analyzing decision options and decision criterion are studied. The focus of the course is the analysis of search and detection operations, particularly as they arise in anti-submarine operations, using probability models. Barrier detection, area search and parallel sweep operations models are developed. Additional topics in mine warfare, target coverage models, anti-air warfare, and target motion analysis may be picked for study by the instructor. Credit cannot be given for both SA302 and SA410.

Offered: Fall

Requisites: Prereq: SM239 or SM230.

Course: SA412

Title: PROJECTS IN OPERATIONS ANALYSIS

Credits: 3-0-3

Description: Operations research techniques are applied using student projects, case studies and visiting lecturers. Topics include current military and industrial problems.

Offered: Spring

Requisites: Prereq: permission of department Chair.

Course: SA421

Title: SIMULATION MODELING

Credits: 3-0-3

Description: Discrete simulation of systems using a simulation language. Includes random variate generation, validation and verification of simulations, input and output data analysis. Semester projects are done as part of an analysis team.

Offered: Fall 2022-2023

Requisites: Prereq: SA233. Coreq: SM339.

Course: SA430

Title: LOGISTICS

Credits: 3-0-3

Description: Investigation of techniques of operations analysis applicable to the solution of problems in reliability, maintainability, availability and inventory.

Offered: Fall 2022-2023

Requisites: Prereq: SM239 or SM230.

Course: SA435

Title: DECISION ANALYSIS

Credits: 3-0-3

Description: This course provides an introduction to modern theory and methods for decision analysis. Decision making under uncertainty and military applications are emphasized. Topics include decision trees, influence diagrams, the value of information and real options, risk, utility theory, and multiple criteria decision making.

Offered:

Requisites: Prereq: SM230 or SM239 or SM316 or permission of Dept Chair.

Course: SA463

Title: TOPICS IN OPERATIONS RESEARCH

Credits: 3-0-3

Description: Senior level topics in operations research. The content will vary in order to keep up with new ideas and approaches. Track elective for SMO. Breadth elective for SMA, SMAH, SMP, and SMPH. Math elective 2 for SME.

Offered: Fall 2022-2023

Requisites: Prereq: Permission of department chair.

Course: SA475

Title: OPERATIONS RESEARCH CAPSTONE

Credits: 3-0-3

Description: This course is a capstone course for the Operations Research major. Students will read and make presentations on topics determined by the instructor. Each student will complete a project on a topic to be agreed upon by the instructor and student. Students will present their results in writing and orally.

Offered: Spring

Requisites: Prereq: 1/C SMO Major or permission of department chair.

Course: SA475E

Title: RESEARCH SEMINAR IN MATHEMATICS WITH ECONOMICS

Credits: 3-0-3

Description: Directed research on a specific topic. Capstone course for Mathematics with Economics majors. Emphasis on empirical work using computers.

Offered: Spring

Requisites: Prereq: 1/C SME major.

Course: SM005

Title: PRE-CALCULUS MATHEMATICS

Credits: 4-1-4

Description: Basic review of algebraic and arithmetic operations, analysis of functions and their graphs, and trigonometry. This course may be required in addition to stated graduation requirements for certain midshipmen

Offered: Fall 2022-2023

Requisites: Prereq: placement by department chair.

Course: SM121

Title: CALCULUS I

Credits: 4-0-4

Description: The first of a traditional two course sequence covering differential and integral calculus of one real variable and infinite series.

Offered: Fall 2022-2023

Requisites: Prereq: None.

Course: SM122

Title: CALCULUS II

Credits: 4-0-4

Description: Continuation of Calculus I.

Offered: Summer 2022-2023, Fall 2022-2023

Requisites: Prereq: Calculus I (SM131 or SM121 or SM161).

Course: SM122X

Title: MULTIVAR CALCULUS W/ REVIEW

Credits: 4-0-4

Description: For those who have had a year of prior calculus study but did not validate Calculus I. Introduction to multivariable calculus topics from the first part of Calculus III with embedded review of topics and skills from first-year calculus. Participation in SM122X entails validation credit for SM131. Completion of SM122X counts as credit for SM122.

Offered: Fall 2022-2023

Requisites: Prereq: Placement by department chair.

Course: SM208

Title: DATA SCIENCE FOR DECISION-MAKING

Credits: 3-0-3

Description: An introduction to data science with particular attention focused on the needs of decision makers. Topics include: descriptive statistics, requirements for causal inference, data manipulation, data visualization and exposition, data generation via probability models, hypothesis testing and confidence intervals via resampling techniques, the Central Limit Theorem and its implications, regression for prediction and inference, additional machine learning methods, ethical issues in machine learning, and critical thinking in the context of data science. Midshipmen will make extensive use of appropriate computer tools.

Offered: Fall 2022-2023

Requisites: Prereq: Calc III (SM221 or SM223)

Course: SM212

Title: DIFFERENTIAL EQUATIONS

Credits: 4-0-4

Description: Linear and simultaneous differential equations; solution by Laplace transform; partial differential equations and Fourier series.

Offered: Summer 2022-2023, Fall 2022-2023

Requisites: Prereq: Calculus III (SM221 or SM223).

Course: SM221

Title: CALCULUS III WITH VECTOR FIELDS

Credits: 4-0-4

Description: Differential and integral calculus of several real variables; vector analysis including integral theorems.

Offered: Fall 2022-2023

Requisites: Prereq: Calculus II (SM122 or SM162).

Course: SM221X

Title: MULTIVARIABLE CALCULUS WITH INFINITE SERIES

Credits: 4-0-4

Description: For those who have completed SM122X. Introduction to multivariable and vector calculus topics from the second part of Calculus III and introduction to infinite sequences and series with embedded review of topics and skills from first-year calculus. Completion of SM221X counts as credit for SM221.

Offered:

Requisites: Prereq: SM122X

Course: SM222

Title: DIFFERENTIAL EQUATIONS WITH MATRICES

Credits: 4-0-4

Description: A more rigorous treatment of material from SM212, the course uses basic ideas from linear algebra. Intended for mathematics and quantitative economics majors.

Offered: Fall 2022-2023

Requisites: Prereq: Calculus III (SM221 or SM223); Coreq: SM261.

Course: SM223

Title: CALCULUS III WITH OPTIMIZATION

Credits: 4-0-4

Description: Differential and integral calculus of several real variables; vector analysis; optimization techniques for functions of several variables.

Offered: Fall 2022-2023

Requisites: Prereq: Calculus II (SM122 or SM162).

Course: SM230

Title: PROBABILITY WITH NAVAL APPLICATIONS

Credits: 3-0-3

Description: An elementary treatment of the basic concepts of probability with an emphasis on naval applications. Sample spaces, discrete and continuous random variables and standard distributions. Selected topics of naval applications of probability theory such as random search, minefields and lateral range curves. Conditional probability and Bayes' theorem. Credit will not be given for both SM230 and SM239.

Offered: Fall 2022-2023

Requisites: Prereq: Calculus II (SM122 or SM162).

Course: SM233

Title: INTRODUCTION TO APPLIED MATHEMATICS

Credits: 2-2-3

Description: This course introduces students to several fundamental topics in applied mathematics: simulation and statistical modeling, applications of linear algebra, partial differential equation models, and computational tools and topics. Appropriate computer software will be introduced.

Offered: Spring

Requisites: Prereq: Calculus III; Coreq: SM261.

Course: SM239

Title: PROBABILITY AND STATISTICS I

Credits: 3-0-3

Description: An applied study of a variety of discrete and continuous probability models. Probability models covered include binomial, Poisson, exponential, gamma, normal, Student-t, and chi-squared. Methods for calculating probabilities and estimating parameters are included. The Law of Large Numbers and the Central Limit Theorem are included. This course is both a stand-alone course and a prerequisite for Applied Statistics I (SM339). Credit will not be given for both SM239 and SM230.

Offered: Fall 2022-2023

Requisites: Prereq/Coreq: Calculus III (SM221 or SM223).

Course: SM242

Title: DISCRETE MATH & PROBABILITY

Credits: 4-0-4

Description: Introduction to first order logic, set theory, proof techniques, counting principles, graph theory, matrix operations, discrete random variables and analysis of algorithms. Credit cannot be given for SM242 if credit has been given for SM342.

Offered: Fall 2022-2023

Requisites: Prereq: SM122 or SM162

Course: SM259

Title: MATHEMATICAL LOGIC

Credits: 3-0-3

Description: Mathematical languages, formal logic, propositional calculus and truth tables, first order predicate calculus, proof theory, axiomatic systems and model theory. Applications to logical networks and nonstandard analysis.

Offered: Fall

Requisites: Prereq: Calculus II (SM122 or SM162).

Course: SM261

Title: MATRIX THEORY

Credits: 3-0-3

Description: Matrices, transformations, linear equations, vector spaces, characteristic matrix, eigenvalues, orthogonality.

Offered: Fall 2022-2023

Requisites: Prereq: Calculus II (SM122 or SM162).

Course: SM263

Title: APPLIED LINEAR ALGEBRA

Credits: 3-0-3

Description: The course covers: systems of equations, matrix arithmetic and factorizations, the rank-nullity theorem, eigenvectors and eigenvalues, the singular value decomposition, the discrete Fourier transform and other filters, regression, and optimization aimed at predictive analytics. Computer programming language will be used throughout the course. Credit will be given for both SM261 and SM263.

Offered:

Requisites: Prereq: Calc II and SD211, or permission of Dept Chair. Coreq: Calc III

Course: SM275

Title: MATHEMATICAL METHODS FOR ECONOMICS

Credits: 3-0-3

Description: Primarily for Economics majors. Presents mathematical methods for economics and associated applications. Matrix operations, simple equilibrium models with matrix methods, difference equations and growth models, constrained optimization for utility maximization or cost minimization. (Fall)

Offered: Fall 2022-2023

Requisites:

Course: SM279

Title: MULTIVARIABLE CALCULUS

Credits: 3-0-3

Description: An introduction to the geometry and analysis of n-dimensional space, including topics on multidimensional curves, inner products, linear functions, real valued functions, Taylor approximations, optimization, inverse function theorem, implicit function theorem, and change of variables in integration. Applications to economics and physics will be discussed.

Offered: Spring

Requisites: Prereq: (SM221 or SM223) and SM261.

Course: SM291

Title: FUNDAMENTALS OF MATHEMATICS

Credits: 3-0-3

Description: Introduction to mathematical reasoning and the written and oral presentation of mathematical concepts, theory, and application of sets and relations.

Offered: Spring

Requisites: Prereq: Calculus II. SME majors may not take both SM291 and SM222.

Course: SM315

Title: INTRO TO PARTIAL DIFF EQNS

Credits: 3-0-3

Description: Linear equations, Cauchy problems, Laplace and Poisson equations, boundary value problems, heat equations, Sturm-Liouville problems, and orthonormal expansions.

Offered: Fall 2022-2023

Requisites: Prereq: Differential Equations (SM212 or SM222).

Course: SM316

Title: ENGR MATH WITH PROB & STATS

Credits: 3-0-3

Description: Basic concepts in probability and statistics, arithmetic of complex numbers, and Fourier analysis. Credit cannot be given for either SM219, SM230, or SM239 and SM316.

Offered: Fall 2022-2023

Requisites: Prereq: Differential Equations (SM212 or SM222).

Course: SM317

Title: STATISTICAL LEARNING

Credits: 3-0-3

Description: This course covers a variety of statistical learning topics, including: function estimation with data, bias-variance tradeoff, classification, linear regression, resampling methods, linear model selection and regularization, non-linear modeling, and tree-based methods, support vector machines, and unsupervised learning.

Offered:

Requisites: Prereq: SM230 or SM239, or permission of Dept Chair.

Course: SM331H

Title: REAL ANALYSIS I

Credits: 4-0-4

Description: Honors versions of SM331.

Offered: Fall 2022-2023

Requisites: Prereq: permission of department chair.

Course: SM332H

Title: REAL ANALYSIS II

Credits: 4-0-4

Description: Honors version of SM334.

Offered: Spring

Requisites: Prereq: permission of department chair.

Course: SM333

Title: SEQUENCES, SERIES & FUNCTIONS

Credits: 4-0-4

Description: This course deals with the convergence properties of sequences and series, including: limit theorems and convergence tests, power series, sequences and series of functions, pointwise and uniform convergence, and the analytic operations preserved by the convergence process. Midshipmen may not receive credit for both SM333 and any of SM331, SM331H, and SM332H.

Offered: Fall 2022-2023

Requisites: Prereq: SM261 and SM291, or permission of department chair.

Course: SM334

Title: ELEMENTS OF ADVANCED CALCULUS

Credits: 3-0-3

Description: This course is a continuation of SM333. Together the courses cover logic, induction, sequences, limits, real numbers, series, continuity, differentiability, properties of continuous functions, the Riemann Integral, and power series.

Offered: Spring

Requisites: Prereq: SM331 or SM331H or SM333

Course: SM339

Title: APPLIED STATISTICS I

Credits: 3-0-3

Description: An applied study of a variety of statistical methods used in obtaining, presenting, summarizing and analyzing statistical information. Included are strategies for data collection and presentation, and techniques of statistical inference for population, parameters based on the concepts of sampling, probability and distribution theory.

Offered: Fall 2022-2023

Requisites: Prereq: SM239 and SM261.

Course: SM342

Title: DISCRETE STRUCTURES

Credits: 3-0-3

Description: Foundations and methods of proof. Combinatorics, graph theory, group theory. Selected topics. Counts as track elective for the SMA and the SMP majors.

Offered: Fall 2022-2023

Requisites: Prereq: SM122 or SM162.

Course: SM350

Title: TOPICS IN PURE & APPLIED MATH

Credits: 3-0-3

Description: Junior-level topics in pure and applied mathematics. The content will vary in order to keep abreast of new ideas and approaches.

Offered: Fall 2022-2023

Requisites: Prereq: permission of department chair.

Course: SM361

Title: INTERMEDIATE LINEAR ALGEBRA

Credits: 4-0-4

Description: This course deals with abstract linear algebra and its applications. Topics include: abstract vector spaces, linear transformations, inner products and norms, orthogonal bases, projections, singular value decomposition and other matrix factorizations, and numerical linear algebra. Applications will be chosen by the instructor, but might include: image compression, principal components analysis, and applications to physics.

Offered: Fall 2022-2023

Requisites: Prereq: (SM233, SM261 and SM291) or permission of department chair.

Course: SM362

Title: MODERN ALGEBRA

Credits: 3-0-3

Description: Integers, groups, mappings, rings, fields.

Offered: Fall 2022-2023

Requisites: Prereq: SM261 and SM291.

Course: SM364

Title: INTRO SCIENTIFIC COMPUTING

Credits: 3-0-3

Description: Computer arithmetic and errors; algorithms and programs for: function approximations, numerical integration, and the numerical solution of ordinary differential equations; an introduction to programming.

Offered: Spring

Requisites: Prereq: SM361 or permission of department chair.

Course: SM411

Title: INTRO TO COMPLEX VARIABLES

Credits: 3-0-3

Description: This course extends the techniques of differential and integral calculus to the complex numbers. Highlights include Cauchy's theorem on integration, the residue theorem, and power series expansions. Applications to real analysis and physical problems will be discussed.

Offered: Fall

Requisites: Prereq: SM331 or SM331H or SM333

Course: SM415

Title: MATH MODEL OCEAN & ATMOS

Credits: 3-0-3

Description: Mathematical Modeling of the Ocean and Atmosphere. Vector analysis, Fourier analysis, partial differential equations with emphasis on stream and potential functions, conservation of mass, conservation of linear momentum (Navier-Stokes Equations) in rectangular and rotating coordinate systems. Use of MATLAB to solve applied problems in oceanography and meteorology.

Offered: Spring

Requisites: Prereq: SO414 or permission of instructor.

Course: SM421

Title: TOPICS IN APPLIED MATHEMATICS II

Credits: 3-0-3

Description: Senior level topics in applied mathematics. The content will vary in order to keep abreast of new ideas and approaches.

Offered: Fall 2022-2023

Requisites: Prereq: permission of department chair.

Course: SM425

Title: ADVANCED NUMERICAL ANALYSIS

Credits: 3-0-3

Description: Numerical solution of equations in one and several variables, direct and iterative algorithms, rate of convergence. Computer methods emphasized.

Offered:

Requisites: Prereq: (SM212 or SM222) and (SM233 or MATLAB) and (SM331 or SM331H or SM333 or approval of department chair) and (SM364 or SM365).

Course: SM426

Title: NUMERICAL METHODS FOR DIFF EQ

Credits: 3-0-3

Description: Interpolation and polynomial approximation, numerical integration and differentiation, numerical algorithms for initial value and boundary value problems.

Offered:

Requisites: Prereq: (SM212 or SM222) and (SM233 or MATLAB) and (SM331 or SM331H or SM333 or approval of department chair) and (SM364 or SM365).

Course: SM437

Title: EXPERIMENTAL DESIGN

Credits: 3-0-3

Description: This is an advanced applied statistics course focusing on the collection and analysis of data arising from either sampling finite populations or arising from scientific experiments. Emphasis is placed on simple random sampling, stratified sampling, cluster sampling, ratio estimation, randomized block designs, factorial designs, and confounding.

Offered: Spring

Requisites: Prereq: SM339.

Course: SM439

Title: TOPICS IN STATISTICS

Credits: 3-0-3

Description: Senior level topics in statistics. The content will vary in order to keep abreast of new ideas and approaches.

Offered: Fall

Requisites: Prereq: SM339 or permission of department chair.

Course: SM444

Title: DISCRETE STRUCTURES II

Credits: 3-0-3

Description: Topics in combinatorics and graph theory, with applications. Latin squares, linear algebra and combinatorics, finite projective planes, topological graph theory, Ramsey theory, trees.

Offered:

Requisites: Prereq: SM342.

Course: SM450

Title: TOPICS IN PURE & APPLIED MATH

Credits: 3-0-3

Description: Senior-level topics in pure and applied mathematics. The content will vary in order to keep abreast of new ideas and approaches.

Offered: Fall, Spring

Requisites: Prereq: permission of department chair.

Course: SM461

Title: LINEAR ALGEBRA

Credits: 3-0-3

Description: Vector spaces, linear transformations, Jordan canonical form, inner product spaces.

Offered: Fall, Spring

Requisites: Prereq: (SM261 and SM291) or permission of department chair.

Course: SM462

Title: ALGEBRAIC STRUCTURES

Credits: 3-0-3

Description: Groups, rings, fields, Galois theory.

Offered:

Requisites: Prereq: SM362.

Course: SM463

Title: TOPICS IN ANALYT/DISCR MATH

Credits: 3-0-3

Description: Senior level topics in pure mathematics. The content will vary in order to keep abreast of new ideas and approaches.

Offered:

Requisites: Prereq: permission of department chair.

Course: SM464

Title: TOPOLOGY

Credits: 3-0-3

Description: A mathematical analysis of topological spaces, separation axioms, covering properties, and metric spaces.

Offered:

Requisites: Prereq: SM331 or SM331H or SM333

Course: SM468

Title: CRYPTO, CODES & INFO SECURITY

Credits: 3-0-3

Description: Cryptography, Codes, and Information Security investigates the mathematics of secret and error-correcting codes.

Offered: Fall 2022-2023

Requisites: Prereq: SM261 or permission of department chair.

Course: SM472

Title: PROJECTS IN MATHEMATICS

Credits: 3-0-3

Description: This course is a capstone course for the the mathematics major. Students will read and make presentations on topics determined by the instructor. Each student will complete a project on a topic to be agreed upon by the instructor and student. Students will present their results in writing and orally.

Offered: Spring

Requisites: Prereq: 1/C SMA Major or permission of department chair.

Course: SM473

Title: PROJECTS IN MATH & APPLIED MATH

Credits: 3-0-3

Description: This course is a capstone course for the mathematics and applied mathematics majors. Students will read and make presentations on topics determined by the instructor. Each student will complete a project on a topic to be agreed upon by the instructor and student. Students will present their results in writing and orally.

Offered: Spring

Requisites: Prereq: 1/C Math Major or permission of department chair.

Course: SM474

Title: PROJECTS IN APPLIED MATHEMATICS

Credits: 3-0-3

Description: This course is a capstone course for the applied mathematics major. Students will read and make presentations on topics determined by the instructor. Each student will complete a project on a topic to be agreed upon by the instructor and student. Students will present their results in writing and orally.

Offered: Spring

Requisites: Prereq: 1/C SMP Major or permission of department chair.

Oceanography Department Courses (SO)

Course: SO221

Title: INTRODUCTION TO OCEANOGRAPHY

Credits: 3-0-3

Description: A descriptive course designed to provide an overview of significant oceanographic factors and their impact on engineering applications. Prereq: Non-SOC majors only.

Offered: Fall, Spring

Requisites: Prereq: Non-SOC/SOCH majors only.

Course: SO242

Title: TORNADOES AND SEVERE STORMS

Credits: 3-0-3

Description: A survey of large-scale mid-latitude meteorology with an emphasis on the processes that promote the development of severe thunderstorms and tornadoes. Methods for diagnosing thermodynamic instability and vertical wind shear are presented and applied to Anticipate storm morphology. Emphasis is placed on the study of supercell thunderstorms and mesocyclonic tornadogenesis. Additional topics include Doppler radar fundamentals, precipitation/hail growth, cloud electrification, and products to diagnose and predict storm evolution. Comfort applying vector calculus and physics concepts is recommended. Enrolled students may be eligible for an internship opportunity to study and observe severe convective storms on the U.S. Great Plains during May.

Offered:

Requisites: Prereq: SM221 and SP211 (or equivalents).

Course: SO251

Title: DESCRIPTIVE PHYSICAL OCEANOGRAPHY

Credits: 3-2-4

Description: This course serves as an introduction to Physical Oceanography. Topics include: Introduction to Geology, Plate Tectonics, Ocean Basins, Sediments and Stratigraphy, Geodesy and Ocean Bathymetry, Properties of Seawater, Ocean Structure, Ocean Heat Balance, Conservation Equations, Equations of Motion, Geostrophic Balance and Flows, Major Ocean Currents, Density Driven Flows, Waves and Tides, Coastal Ocean, and Ocean Optics and Acoustics. This 4-credit course has a laboratory component that provides a general introduction to field methods for collecting data related to Physical Oceanography and data analysis using statistical and graphical software programs.

Offered: Fall 2022-2023

Requisites:

Course: SO254

Title: INTRODUCTION TO METEOROLOGY

Credits: 2-2-3

Description: This course serves as an introduction to Meteorology. Topics include: Meteorological state variables, the equation of state for air, radiative balance, climate change and climate variability, atmospheric water vapor, cloud formation processes, and cloud microphysics, forces involved in atmospheric motion, geostrophic flow, atmospheric stability, surface and upper analyses and thermodynamic charts. This three credit course includes a laboratory component that involves the analysis and visualization of meteorological datasets with Matlab.

Offered:

Requisites: Prereq: SO251 (can take concurrently).

Course: SO262

Title: PHYSICAL GEOGRAPHY

Credits: 3-0-3

Description: The physical environment influences natural resources, human culture, national security, and military operations. This course examines the basic scientific principles of physical geography and how location on earth influences climate, landforms, soils, and natural vegetation. We will study the processes at work, the features created and their spatial distributions.

We will use satellite imagery and geographical information systems to look at case studies around the world and examine the wide range of natural environments.

Offered: Fall 2022-2023

Requisites: Prereq: None.

Course: SO264

Title: STATISTICS FOR OCEAN AND ATMOSPHERIC SCIENCES

Credits: 3-0-3

Description: This course provides an introduction to the application of statistical methods to geophysical data. Topics include: basic probability and combinations, probability distributions, Bayesian inference, hypothesis testing, confidence intervals, linear regression, and time series analysis.

Offered:

Requisites: Coreq: SO251

Course: SO335

Title: OCEANOGRAPHIC & METEOROLOGICAL QUANTITATIVE METHOD

Credits: 2-2-3

Description: Oceanographic and Meteorological Quantitative Methods. A course to expose students to products and datasets that are available in oceanography and meteorology and techniques for manipulating the data to arrive at a better quantitative understanding of the oceans and atmosphere.

Offered: Fall 2022-2023

Requisites: Prereq: SM212, SO251, SO254 (Can take concurrently).

Course: SO345

Title: ATMOSPHERIC THERMODYNAMICS

Credits: 2-2-3

Description: This course studies the thermodynamic properties of the atmosphere, including the temperature moisture processes, as well as the forces responsible for vertical atmospheric motion. This course uses thermodynamic diagrams for analyzing vertical profiles of atmospheric variables.

Offered: Fall 2022-2023

Requisites: Prereq: SP212, SM212 (Can take concurrently).

Course: SO345H

Title: HONORS ATMOSPHERIC THERMODYNAMICS

Credits: 2-2-3

Description: Course is an advanced version of SO345 for honor students. This course studies the thermodynamic properties of the atmosphere, including the temperature moisture processes, as well as the forces responsible for vertical atmospheric motion. This course uses thermodynamic diagrams for analyzing vertical profiles of atmospheric variables.

Offered: Fall 2022-2023

Requisites: Prereq: SP212, SM212 (Can take concurrently), and SOCH majors only.

Course: SO351

Title: BIOGEOCHEMICAL OCEANOGRAPHY

Credits: 3-2-4

Description: An introduction to geological, chemical, and biological processes in the oceans. This course builds upon the fundamentals of physical oceanography provided in SO251 by adding the close interactions among geological, chemical and biological processes to the physical setting of the water column. Topics range from hydrothermal circulation, sediment diagenesis, nutrient cycling, ocean alkalinity, biological production, food webs, taxonomy, and ecology. Real-world applications are emphasized. This 4-credit course has a laboratory component that reinforces field data collection and analysis techniques presented in SO251 and SO264.

Offered: Fall 2022-2023

Requisites: Prereq: SO251, SO264.

Course: SO414

Title: OCEANIC AND ATMOSPHERIC PROCESSES

Credits: 3-2-4

Description: Fundamental equations of motion governing the dynamics of quasi-horizontal, inviscid and viscous fluid flow on the rotating earth are developed. Scale analyses of the basic hydrodynamic equations are used to identify forces responsible for motions of interest. Basic numerical modeling techniques for both oceanic and atmospheric processes are introduced. Laboratory exercises will utilize the MATLAB software package to solve hands-on problems pertaining to fluid flow.

Offered: Fall

Requisites: Prereq: SO335 and SO345.

Course: SO416

Title: WAVES AND TIDES

Credits: 2-2-3

Description: Equations governing the dynamics of surface and internal waves, including tsunamis, seiches, internal tides, and tidal bores, are derived and practically applied. Wave theory is compared to wave tank observations. Wave statistics and energy spectra are used to forecast sea and swell. Tide generating and tractive forces are mathematically analyzed, and methods of tidal prediction are reviewed and exercised.

Offered: Fall 2022-2023

Requisites: Prereq: SO414.

Course: SO422

Title: NEARSHORE OCEANOGRAPHY

Credits: 2-2-3

Description: Examines the oceanographic regime from the continental shelf break to the intertidal zone and coastal dunes. Concentrates on shallow water wave, surf and beach processes. Includes a discussion of coastal management and engineering procedures.

Offered: Fall, Spring

Requisites: Prereq: SO351.

Course: SO426

Title: POLAR OCEANOGRAPHY

Credits: 2-2-3

Description: A descriptive course which covers the history of polar exploration as well as the physical oceanography and meteorology of the polar regions with particular emphasis on the role of sea ice in global warming studies. Current DoD polar programs will be reviewed including the following: Deep Freeze, International Ice Patrol and Navy operations such as ICEX and TEAMWORK.

Offered: Spring

Requisites: Prereq: SO351.

Course: SO427

Title: INTRODUCTION TO ESTUARINE OCEANOGRAPHY

Credits: 2-2-3

Description: The physical, geological and biological aspects of the estuarine environment are studied. Laboratory sessions, which include YP cruises and field trips, focus on practical and hands-on applications. Environmental issues such as water quality and pollution are discussed. The use of numerical models as a tool is explored.

Offered: Fall

Requisites: Prereq: SO351.

Course: SO431

Title: ENVIRONMENTAL REMOTE SENSING

Credits: 2-2-3

Description: An overview is given of the various platforms and sensors currently in use and planned. The electromagnetic spectrum and radiation laws are explained. Applications exercises give "hands-on" experience with image processing systems.
Offered: Fall, Spring
Requisites: Prereq: none.

Course: SO432

Title: GEOGRAPHICAL INFORMATION SYSTEMS

Credits: 2-2-3

Description: Geographical Information Systems (GIS) use computers to manipulate geographic data, combining maps and data bases. This course examines the basics of map projection and datums, raster and vector data bases, and the design, manipulation, and analysis of geographic data. We will discuss the use of remote sensing to collect data and provide background maps, and the use of digital elevation models to provide a framework for 3D display.

Offered: Fall

Requisites: Prereq: None.

Course: SO441

Title: SYNOPTIC METEOROLOGY

Credits: 2-2-3

Description: A practical course in meteorological analysis and forecasting as applied to operational planning. A variety of meteorological datastreams available in the computerized Meteorology Laboratory are used to analyze and predict the current and future state of the atmosphere.

Offered: Fall, Spring

Requisites: Prereq: SO335 (can take concurrently).

Course: SO442

Title: TROPICAL METEOROLOGY

Credits: 2-2-3

Description: A study of the special processes affecting meteorological analysis and forecasting in the tropics, including satellite imagery analysis, with particular emphasis on hurricane or typhoon prediction, creation, movement and decay.

Offered: Fall

Requisites: Prereq: SO335 (can take concurrently).

Course: SO445

Title: GLOBAL CLIMATE CHANGE

Credits: 2-2-3

Description: This course will review the science of climate and the natural factors that influence global climate on different spatial and temporal scales. It will also discuss how human activities may impact local, regional, and global climate. Global climate data, past and present, will be examined from geologic and modern records including satellite data, land/sea observations, ice cores, etc. Related climate topics, such as the Ozone Hole, Greenhouse Effect, and El Nino will also be reviewed.

Offered: Fall 2022-2023

Requisites: Prereq: SO351, SO345/345H.

Course: SO451

Title: BIOLOGICAL OCEANOGRAPHY

Credits: 2-2-3

Description: A study of patterns and concepts of biological production in the ocean. Emphasis is on the integration of the biological and physical environment. Laboratory includes student planned studies and conceptual exercises. All aspects of the course emphasize the use of various knowledge areas to solve a problem.

Offered: Fall 2022-2023

Requisites: Prereq: SO351 (can take concurrently).

Course: SO461

Title: GEOLOGICAL OCEANOGRAPHY

Credits: 2-2-3

Description: Introduces marine geological/geophysical instrumentation, theory, data collection, analysis, interpretation and applications. Geomorphology, structure, petrology, sedimentation, stratigraphy, origin and development of ocean basins and margins are examined in light of theory of plate tectonics. Practical studies of the Chesapeake Bay are part of the laboratory work.

Offered: Fall 2022-2023

Requisites: Prereq: SO251.

Course: SO470

Title: CAPSTONE SEMINAR

Credits: 3-0-3

Description: A course for SOC majors to provide guidance on the construction of the capstone paper and the oral presentation of the capstone paper. The course will include background readings and corresponding discussions, and instruction on scientific writing and presentation. The course culminates in the production of the capstone paper and the oral presentation the capstone paper.

Offered:

Requisites: Prereq: 1/C Oceanography major.

Course: SO475

Title: READINGS IN OCEANOGRAPHY AND METEOROLOGY

Credits: 0-6-3

Description: An independent study course in conjunction with a faculty member to prepare midshipmen to conduct independent research. In this course, the midshipmen will meet with their adviser to discuss topics in scientific literature related to their research project. They will also write a summary report of the scientific literature they have reviewed, which will be integrated in their final research project report in the following semester.

Offered: Fall 2022-2023

Requisites: Prereq: 2/C or 1/C standing and approval of department chair.

Course: SO476

Title: READINGS IN OCEANOGRAPHY AND METEOROLOGY

Credits: 0-6-3

Description: An independent study course in conjunction with a faculty member to prepare midshipmen to conduct independent research. In this course, the midshipmen will meet with their adviser to discuss topics in scientific literature related to their research project. They will also write a summary report of the scientific literature they have reviewed, which will be integrated in their final research project report in the following semester.

Offered: Spring

Requisites: Prereq: 2/C or 1/C standing and approval of department chair.

Course: SO503

Title: HONORS RESEARCH METHODS

Credits: 2-2-3

Description: Honors Research Methods in Oceanography and Meteorology. Statistical methods and techniques applied to research topics, oceanographic and laboratory instrumentation, remote sensing and mathematical modeling. Discussion of current research topics. Prepares students to undertake independent research in oceanography or meteorology.

Offered: Spring

Requisites: Prereq: SO335 and 2/C SOCH major.

Course: SO505

Title: HONORS INDEPENDENT RESEARCH

Credits: 0-6-3

Description: Independent research in oceanography or meteorology on a subject of the student's choice, culminating in a written report and presentation to the faculty.

Offered: Fall 2022-2023

Requisites: Prereq: SO503 and SOCH major.

Course: SO506

Title: HONORS INDEPENDENT RESEARCH

Credits: 0-6-3

Description: Independent research in oceanography or meteorology on a subject of the student's choice, culminating in a written report and presentation to the faculty.

Offered: Spring

Requisites: Prereq: SO503 and SOCH major.

Course: SO513

Title: HONORS OCEANIC AND ATMOSPHERIC PROCESSES

Credits: 3-2-4

Description: Course is an advanced version of SO414 for honors students.

Offered: Fall

Requisites: Prereq: SO335 and SO345H and SOCH major.

Course: SO516

Title: HONORS WAVES AND TIDES

Credits: 2-2-3

Description: Course is an advanced version of SO416 for honor students.

Offered: Fall 2022-2023

Requisites: Prereq: SO513 and SOCH major.

Physics Department Courses (SP)

Course: SP211

Title: GENERAL PHYSICS I

Credits: 3-2-4

Description: The first of a two course sequence emphasizing the fundamental principles of classical physics and introducing a variety of applications. Topics include mechanics, electricity, magnetism, wave motion, fluids, sound and light. Lectures, recitations, hands-on laboratories, and large-scale demonstration lectures are employed.

Offered: Fall 2022-2023

Requisites: Prereq: Chemistry II (SC112 or SC151); Coreq: Calculus III (SM221 or SM223 or SM251) or approval of department chair.

Course: SP212

Title: GENERAL PHYSICS II

Credits: 3-2-4

Description: Continuation of SP211. See SP211 description for topics.

Offered: Summer 2022-2023, Fall 2022-2023

Requisites: Prereq: Physics I (SP211 or SP221) or approval of department chair.

Course: SP221

Title: PHYSICAL MECHANICS I

Credits: 3-2-4

Description: A first course in classical mechanics for physics majors. Newton's laws are applied to particles and systems of particles. Energy and momentum methods are developed. Applications include simple, damped, and driven harmonic motion as well as gravitation and orbital motion.

Offered: Fall 2022-2023

Requisites: Prereq: Chemistry II (SC112 or SC151); Coreq: SM221 or approval of department chair.

Course: SP222

Title: ELECTRICITY AND MAGNETISM I

Credits: 3-2-4

Description: A first course in electricity and magnetism for physics majors, with an emphasis on the concepts of fields and potential. The course culminates in the formulation of Maxwell's equations.

Offered: Spring

Requisites: Prereq: SP221 or SP211.

Course: SP226

Title: HEAT, SOUND, AND LIGHT

Credits: 3-2-4

Description: A first course on the basic concepts of thermodynamics, acoustics, and optics for physics majors. Topics include heat engines, refrigerators, cosmology, the Doppler effect, beats, shock waves, fluids, lenses, telescopes, polarization, interference and diffraction.

Offered: Spring

Requisites: Prereq: SP211 or SP221.

Course: SP247

Title: INTRODUCTION TO ASTROPHYSICS

Credits: 3-0-3

Description: The fundamentals of astronomy as a physical science, surveying the Universe from the solar system through stellar, galactic and extragalactic astronomy and cosmology with extra emphasis on calculations needed in astronomy. Additionally, this course gives an introduction to scientific programming and the statistical techniques needed to interpret modern experimental data.

Offered: Fall

Requisites: Corequisites: SP221

Course: SP301

Title: MODERN PHYSICS

Credits: 3-0-3

Description: An introduction to the theories of relativity and quantum mechanics. Topics include relativistic mechanics, blackbody radiation, wave-particle duality, the Bohr theory, quantum phenomena, nuclear decay and nuclear reactions.

Offered: Fall 2022-2023

Requisites: Prereq: SP212 or SP226.

Course: SP310

Title: ASTRONOMY

Credits: 3-0-3

Description: The fundamentals of astronomy as a physical science, surveying the Universe from the solar system through stellar, galactic and extragalactic astronomy and cosmology.

Offered: Fall 2022-2023

Requisites: Prereq: SP211 and SP212 or SP221, SP222 and SP226 or approval of director of the astrophysics track.

Course: SP324

Title: APPLIED QUANTUM MECHANICS

Credits: 3-2-4

Description: Applications of quantum mechanics to physical systems. Topics covered are quantum statistics, multi-electron atoms, molecules, properties of solids, superconductivity, nuclear models and reactions, and elementary particles. Modern physics investigations are performed in the laboratory.

Offered: Spring

Requisites: Prereq: SP351; Coreq: SP352.

Course: SP327

Title: TWENTIETH CENTURY PHYSICS

Credits: 3-0-3

Description: A study of the development of physics in the twentieth century, with particular attention given to relativity theory, quantum theory, and atomic physics.

Offered: Fall 2022-2023

Requisites: Prereq: SP222 and SP226; or ENR major and SP212; or approval of department chair.

Course: SP333

Title: PHYSICAL MECHANICS II

Credits: 4-0-4

Description: An intermediate course in physical mechanics for physics majors. Newtonian, Hamiltonian, and Lagrangian mechanics with special emphasis on the central force problem and noninertial reference frames.

Offered: Fall 2022-2023

Requisites: Prereq: (SP221 or SP211) and SM212.

Course: SP342

Title: ELECTRICITY AND MAGNETISM II

Credits: 4-0-4

Description: An intermediate course in electromagnetic theory for physics majors. Maxwell's equations are formulated in the notation of vector analysis and applied to various situations.

Offered: Spring

Requisites: Prereq: SP351

Course: SP351

Title: PROBLEM SOLVING METHODS I

Credits: 3-0-3

Description: Problem Solving Methods for Physics I. A course in the techniques of mathematics for physics with special emphasis on applications for intermediate mechanics. The course includes a detailed examination of coordinate systems; applied integration, differential equations and Fourier series; linear algebra, introduction to vector spaces; vector calculus; and additional topics chosen from geometry, calculus of variations and special applications in physics.

Offered: Fall 2022-2023

Requisites: Prereq: SM212; Coreq: SP212 or SP222.

Course: SP352

Title: PROBLEM SOLVING METHODS II

Credits: 3-0-3

Description: Problem Solving Methods for Physics II. A course in the techniques of mathematics for general physics with special emphasis on applications for electromagnetism and quantum mechanics. The course includes applications of vector calculus, further applications of linear vector spaces, boundary value problems, techniques for quantum mechanics, and additional topics chosen from among introductory numerical methods, fundamentals of statistics and special applications in physics.

Offered: Spring

Requisites: Prereq: SP351.

Course: SP411

Title: UNDERWATER ACOUSTICS AND SONAR

Credits: 3-0-3

Description: A fundamental study of sound propagation in the ocean environment as it relates to the design and operation of sonar. Topics include wave mechanics, detection theory, Fourier analysis, ray tracing, waveguides, and scattering.

Offered: Fall 2022-2023

Requisites: Prereq: SP212 or SP226.

Course: SP425

Title: ADVANCED QUANTUM THEORY

Credits: 3-2-4

Description: Advanced techniques for describing quantum systems. Topics covered are quantum mechanics formalism, techniques for solving the Schrodinger equation, perturbation theory, the real hydrogen atom, and angular momentum algebra. The laboratory focuses on building experimental skills through advanced experiments.

Offered: Fall 2022-2023

Requisites: Prereq: SP324 and SP352.

Course: SP434

Title: NUCLEAR PHYSICS

Credits: 3-2-4

Description: A study of the basic static and dynamic properties of the nucleus and of the interaction of particles and radiation with matter. Emphasis on the experimental techniques. Where appropriate, quantum mechanical interpretations of the phenomena are given.

Offered: Spring

Requisites: Prereq: SP324.

Course: SP436

Title: ACOUSTICS

Credits: 3-2-4

Description: An introduction to modern acoustics. Topics include vibration and normal modes; coupled oscillators; discrete Fourier transforms; radiation, transmission and detection of sound waves; electroacoustics; psychoacoustics, architectural acoustics, musical acoustics and Sonar.

Offered: Fall 2022-2023

Requisites: Prereq: (SP212 or SP226) and SM212.

Course: SP438

Title: OPTICS

Credits: 3-2-4

Description: An introduction to modern optics. Topics include polarization, interference, coherence, diffraction, Fourier transforms, holography, optics of solids and basic laser physics.

Offered: Fall 2022-2023

Requisites: Prereq: SP342.

Course: SP442

Title: SOLID STATE PHYSICS

Credits: 3-2-4

Description: An introduction to the physics of condensed matter. Topics include crystalline and noncrystalline solids, band theory, semiconductors, magnetism, and superconductivity.

Offered: Spring

Requisites: Prereq: SP324 or approval of department chair.

Course: SP444

Title: THERMAL PHYSICS

Credits: 3-0-3

Description: A presentation of topics in thermal properties of matter and radiation as derived from the laws of quantum mechanics and statistics.

Offered: Spring

Requisites: Prereq: SP324.

Course: SP445

Title: ASTROPHYSICS I

Credits: 3-0-3

Description: A study of the physics of astronomical objects such as stars and galaxies.

Offered: Fall 2022-2023

Requisites: Prereq: SM212 and (SP301 OR SP324) and (SP310 or approval of the director of astrophysics track).

Course: SP446

Title: ASTROPHYSICS II

Credits: 3-0-3

Description: This course is a continuation of SP445 (Astrophysics I). It is designed for the first-class astrophysics-track. Students explore the current understanding of extragalactic astrophysics and cosmology. In particular, they study the structure and dynamics of various galactic types, the large-scale structure of the universe and the origin and fate of the universe itself.

Offered: Spring

Requisites: Prereq: SP445.

Course: SP447

Title: OBSERVATIONAL ASTROPHYSICS

Credits: 3-2-4

Description: This laboratory course gives students hands-on experience with the techniques of modern astrophysical observation, data analysis and interpretation. Observations are made with instruments ranging from binoculars to optical and radio telescopes, and detectors ranging from the human eye to state-of-the-art charge coupled devices and radio receivers. These data, as well as observations available on-line, are reduced with modern analysis methods with particular emphasis on image processing. A variety of projects explore the major observational fields of astrometry, photometry, spectroscopy and imaging, and how they provide our fundamental knowledge about the Universe.

Offered: Fall 2022-2023

Requisites: PREREQ: SP310

Course: SP454

Title: INTRO TO ELEMENTARY PARTICLE PHYSICS

Credits: 3-0-3

Description: An introductory course in high-energy physics including the detector technology. Topics will include the Standard Model of Particle Physics and its historical development, the four fundamental forces, special relativity and 4-vectors, symmetries, Feynman diagrams, and detector technologies used at modern particle colliders like RHIC (Relativistic Heavy Ion Collider), the LHC (Large Hadron Collider), and the EIC (Electron-Ion Collider).

Offered:

Requisites: Pre- or Co-req: SM212 and either SP212 or SP222.

Course: SP503

Title: HONORS PHYSICS RESEARCH

Credits: 0-6-3

Description: This course allows midshipmen to perform a physics research project. Midshipmen choose a topic by consulting with a physics faculty member. A formal proposal to the department research committee is required as well as a final oral presentation to the department, a written final paper which will be evaluated by Physics faculty other than the advisor, and a poster presentation at the Yard-wide research day. (Fall)

Offered: Fall 2022-2023

Requisites: Approval of department chair.

Course: SP504

Title: HONORS PHYSICS RESEARCH

Credits: 0-6-3

Description: This course allows midshipmen to perform a physics research project. Midshipmen choose a topic by consulting with a physics faculty member. A formal proposal to the department research committee is required as well as a final oral presentation to the department, a written final paper which will be evaluated by Physics faculty other than the advisor, and a poster presentation at the Yard-wide research day. (Spring)

Offered:

Requisites: Approval of department chair.

Course: SP520

Title: HONORS PHYSICS SEMINAR I

Credits: 1-0-1

Description: Midshipmen will study current topics in physics, hear lectures from USNA faculty and from visiting scholars, and practice reading, understanding, and presenting modern publications of physics with a technically skilled audience in a scientific setting. Oral progress reports will be required throughout the semester. Students will participate in critiquing each others reports. Their methods of critique will be evaluated by the instructor. (Fall)

Offered: Fall 2022-2023

Requisites: Approval of department chair.

Course: SP521

Title: HONORS PHYSICS SEMINAR II

Credits: 1-0-1

Description: Midshipmen will study current topics in physics, hear lectures from USNA faculty and from visiting scholars, and practice reading, understanding, and presenting modern publications of physics with a technically skilled audience in a scientific setting. Oral progress reports will be required throughout the semester. Students will participate in critiquing each others reports. Their methods of critique will be evaluated by the instructor. Furthermore, this semester will include focus on preparation for the Physics majors field test. The majors field test itself will factor into the final grade for the course. (Spring)

Offered:

Requisites: Approval of department chair.

Leadership, Ethics and Law Department Courses (NE, NL, NP)

Course: NE203

Title: ETHICS AND MORAL REASONING

Credits: 3-0-3

Description: This course is designed for Midshipmen to evaluate the moral responsibilities inherent in military leadership, responsibilities that require discerning moral perception, reflective ethical deliberation, and the development of moral virtue. Recent and historical case studies are combined with insights from ethical theory in order to consider how the long history of ethical thought can best be applied to the life of a modern, professional military leader.

Offered: Fall 2022-2023

Requisites: Prereq: 3C standing.

Course: NL110

Title: PREPARING TO LEAD

Credits: 2-0-2

Description: Midshipmen examine fundamental tenets of leadership in the context of the theories and principles of individual and group leadership during their first semester. Topics include self-knowledge, self-leadership, and team leadership as well as a Brigade Leader seminar on peer leadership. Midshipmen learn about themselves as leaders through inventories such as the Myers-Briggs Type Indicator, StrengthsFinder inventory, and Values in Action survey which culminates in creating a personal life mission statement. The course instructors provide relevant personal and Fleet-based examples and emphasize interactive learning.

Offered: Fall 2022-2023

Requisites: Prereq: 4/C standing.

Course: NL200

Title: HUMAN BEHAVIOR

Credits: 3-0-3

Description: An introduction to the science of psychology, this course covers the theories and principles of individual and group human behavior. Topics include learning, personality, social psychology, memory, human development, brain-functioning, health psychology and psychopathology. This course emphasizes research-based discoveries in the field of psychology. Students are prepared to critically evaluate behavioral science research and apply salient principles to leadership. Counts for lower level Humanities-Social Science credit.

Offered: Fall 2022-2023

Requisites: Prereq: none.

Course: NL211

Title: SOCIAL PSYCHOLOGY

Credits: 3-0-3

Description: This course focuses on human behavior in the social context. How individuals influence and are influenced by groups, as well as the field of group dynamics will be examined. Emphasis is placed on research-based findings in the areas of causal attribution, social perception, interpersonal attraction, attitudes and attitude change, group dynamics, prosocial behavior and aggression. Particular emphasis is given to application in the military setting. Counts for lower level Humanities-Social Science credit.

Offered:

Requisites: Prereq: none.

Course: NL230

Title: INTRODUCTION TO SOCIOLOGY

Credits: 3-0-3

Description: Sociology is the scientific study of society and the interactions among human beings. The purpose of this course is to provide a survey of the field of sociology and educate and inspire Midshipmen to examine contemporary situations that involve social interaction. Students will use sociological concepts, theories, and research to explain what is taking place, identify

social threads and patterns across the situations, and determine the personal as well as the social significance of the analysis. Sociology demands that the student transcend the taken-for-granted, subjective world view and develop a sociological imagination by revealing the linkages and relationships among social facts and connect public issues to self awareness. Students will engage in the identification of common threads across social situations and determine the self and social significance of facts. The teaching and learning strategy involves reading, writing, discussions, presentations, and other active-learning, hands-on projects. Particular emphasis is placed on understanding the basics of the field, to include micro, macro, and meso applications. Counts for lower level Humanities-Social Science credit.

Offered: Fall 2022-2023

Requisites: Prereq: NL110.

Course: NL306

Title: PERSONALITY

Credits: 3-0-3

Description: This course offers an exploration of major influences on the development of personality from both theoretical and clinical perspectives. Theories covered include psychoanalytic, behavioral, cognitive, humanistic and biopsychosocial. This course addresses contemporary research and practice relative to assessment and understanding of personality traits, styles and disorders. Midshipmen will examine their own personality assets and liabilities and implications for leadership. Counts for upper level Humanities-Social Science credit.

Offered:

Requisites: Prereq: NL200.

Course: NL310

Title: LEADERSHIP: THEORY AND APPLICATIONS

Credits: 3-0-3

Description: Students examine the theory and research of the contingent and dynamic process of leadership. Students refine and further develop their understanding of personal strengths, values, and growth opportunities in the context of team, group, and organizational leadership, as well as through the creation of a leadership vision and professional development plan. The course combines literature from the fields of social psychology, organizational behavior, and group dynamics to help students understand the factors that influence leadership in a military context.

Offered: Summer 2022-2023, Fall 2022-2023

Requisites: Prereq: 2/C standing.

Course: NL311

Title: PSYCHOLOGY OF LEADERSHIP

Credits: 3-0-3

Description: This is an intensive and experientially-focused course that emphasizes leader self-analysis and skill development. Areas covered include personnel management, team development and performance enhancement at both individual and group levels. Research findings from industrial/organizational consultation, learning, motivation, social behavior, group dynamics, personality, counseling, social perception and interpersonal influence will provide the undergirding for developing knowledge, attitudes and skills which contribute to effective leadership. Counts for upper level Humanities-Social Science credit.

Offered:

Requisites: Prereq: 3/c standing or higher.

Course: NL312

Title: ABNORMAL PSYCHOLOGY

Credits: 3-0-3

Description: Explores the origins, symptoms, diagnosis and management of psychological disorders. Midshipmen gain an understanding of the root causes of psychological disturbance, including personality disorders. The cognitive, emotional, behavioral and cultural manifestations of these disorders are explored. Strategies for effective prevention and management of psychopathology in operational environments are addressed. Midshipmen also learn techniques for rapid assessment and triage of psychiatric crises. Counts for upper level Humanities-Social Science credit.

Offered: Fall 2022-2023

Requisites: Prereq: None.

Course: NL335

Title: ARMED FORCES AND SOCIETY

Credits: 3-0-3

Description: This course examines the American military as a social institution using sociological concepts, theories, and methods. The internal organization and practices of the armed forces and the relationships between the military and other social institutions comprise the field of study. To understand the armed forces and their place in society it is necessary to consider forces, past, present and future, that influence and shape the military. Topics include: military culture and socialization; race and gender, recruiting and retention; changes in military organization; marriage and military families; warfare, technology, and the media. Counts for upper level Humanities-Social Science credit.

Offered:

Requisites: NL230 recommended.

Course: NL340

Title: CHANGE MANAGEMENT

Credits: 3-0-3

Description: This course will explore the theories, practices and tools/techniques for managing change in an organizational environment. Applicable theories and strategic approaches to solving organization problems such as human performance technology, organizational development, and "Lean Six Sigma" will be analyzed and compared. The overarching goal of this course is to develop the knowledge, abilities and skills that will assist future Navy and Marine Corps officers to successfully implement change and transformation in a variety of military organizational environments in the Fleet. Counts for upper level Humanities-Social Science credit.

Offered: Fall

Requisites: Prereq: NL310 or permission of department chair.

Course: NL360

Title: CULTURE AND LEADERSHIP

Credits: 3-0-3

Description: This course will explore the theories and concepts of culture from multiple perspectives in order to provide future military officers with a broad understanding of the role of culture and human terrain in communities, societies and in the armed forces. Students will develop knowledge, abilities and skills that will assist future officers to successfully operate in the context of complex military environments around the globe. The course will follow a pedagogical approach of classroom theory integrated with the case study method of analysis and fieldwork conducted both on the Yard and away from USNA. Counts for upper level Humanities-Social Science credit.

Offered: Summer

Requisites: Prereq: 2/C standing or permission of department chair.

Course: NL400

Title: LAW FOR THE JUNIOR OFFICER

Credits: 2-0-2

Description: This course provides a broad survey of military law applicable to the junior officer. Students examine operational law concepts including the Law of Armed Conflict and the Law of the Sea. The course also explores a variety of military justice topics including constitutional issues such as search and seizure and self-incrimination, judicial and non-judicial forums and the administrative separation of enlisted service members from the Navy and Marine Corps.

Offered: Summer 2022-2023, Fall 2022-2023

Requisites: Prereq: 1/C standing or permission of department chair.

Course: NL410

Title: LAW OF ARMED CONFLICT

Credits: 3-0-3

Description: This course will develop a basic understanding of the international law of armed conflict (LOAC), emphasizing contemporary issues facing junior officers at the tactical level. The course will acquaint students with the historical background of LOAC, examining the sources of the LOAC to include Hague Law, Geneva Law, and customary international law (CIL). The course will examine the complex issues on today's battlefield to include conflict status and individual status, targeting and the use of force, and detention operations. Counts for upper level Humanities-Social Science credit.

Offered: Fall 2022-2023

Requisites: Prereq: 1/C or 2/C standing.

Course: NL420

Title: COMMUNICATING AS A LEADER

Credits: 3-0-3

Description: This course examines how leaders use verbal, nonverbal, written, and visual communications to convey their vision and influence both their seniors and subordinates. The students will study interpersonal communication theory, analyze the communications techniques and styles of historical leaders, interact with guest speakers, assess technological aids to communication, and gain practical experience through assigned projects. Counts for upper level Humanities-Social Science credit.

Offered:

Requisites: Prereq: NL310.

Course: NL425

Title: ENGINEERING LEADERSHIP

Credits: 3-0-3

Description: The purpose of this course is to study the concepts and context of leadership in the technical and industrial environment. The course combines lecture, readings about technical leadership, and real-world case studies. Programs such as Apollo, the Joint Strike Fighter, the Vision for Space Exploration, and significant failures of major engineering programs will be analyzed from the technical leadership perspective. This course will illustrate how management of such complex technological programs requires the melding of technical expertise, organizational theory, and leadership. The subject matter has relevance for military leaders as they are increasingly being called upon to lead and manage in technical and industrial environments. Counts for upper level humanities-social science credit.

Offered: Fall 2022-2023

Requisites: Prereq: 1C or 2C Engineering major or Dept Chair approval.

Course: NL430

Title: LEADERSHIP IN GROUPS AND ORGANIZATIONS

Credits: 3-0-3

Description: This course investigates models of leadership drawn from military sociology and organizational behavior. It provides an overview of the critical scholarship on how large, complex, formal organizations like the Navy function and examines the leadership process within such organizations. Topics include group formation and performance, organizational culture and change from the perspective of junior leaders, and the challenges and imperatives of leadership under changing organizational circumstances. Counts for upper level Humanities-Social Science credit.

Offered:

Requisites: Prereq: None.

Course: NL435

Title: PEACE WAR AND SOCIAL CONFLICT

Credits: 3-0-3

Description: This upper division course examines the social and military aspects of war and peace. Using sociological theories, concepts and methods the course considers, at the macro level of analysis, war and combat as social conflict (origins and causes, events and processes, effects and outcomes). At the meso-level of analysis, the course addresses the dynamic effects of social structure in the processes of war, combat and peace. While the Modern Western experience occupies a considerable section of the course, non-Western analyses of war and peace, as well as other forms of social conflict and resolution are introduced. Counts for upper level Humanities-Social Science credit.

Offered: Spring

Requisites: Prereq: 1/C standing.

Course: NP230

Title: INTRODUCTION TO PHILOSOPHY

Credits: 3-0-3

Description: An introduction to philosophy through close study of one or more classic works of philosophy, with an emphasis on examining philosophical conceptions of leadership. In recent semesters, these have included Plato's Republic (and other dialogues of Plato), Descartes' Meditations on First Philosophy, Kant's Prolegomena to any Future Metaphysics and historical essays (including "Perpetual Peace"), Nietzsche's Beyond Good and Evil, and selections of essays on political and military leadership by Plutarch, Machiavelli, Locke, Hegel, Kierkegaard, and other modern and contemporary philosophers. The emphasis of the course is on careful reading and analysis of the text, and on seminar discussion among the class participants (what Plato described as "dialectic" and reckoned in the Republic to be among the chief prerequisites for sound military and political leadership), together with several substantial writing assignments, and written mid-term and final examinations. Counts for lower level Humanities-Social Science credit.

Offered:

Requisites: Prereq: None; Coreq: NE203.

Course: NP232

Title: MILITARY ETHICS: THE CODE OF THE WARRIOR

Credits: 3-0-3

Description: Why do warriors fight? How do they fight? What should bring a warrior honor? What should bring them shame? What is really worth dying for? There have been special warrior cultures in countless societies across the globe, through every era in history. Were these warriors just killers, or did they have their own unique codes of behavior? This course explores several warrior traditions: the Ancient Greeks, the Vikings, the Romans, the Celts, Knights and Chivalry, African Tribesmen, Native American Warriors, Chinese Warrior Monks, Japanese Samurai, and 20th Century warriors, and applies the lessons of their experience and warrior philosophy to the task of creating the ideal code for warriors of the new millennium. Counts for lower level Humanities-Social Science credit.

Offered: Fall 2022-2023

Requisites: Prereq: None.

Course: NP240

Title: PHILOSOPHY AT THE MOVIES

Credits: 3-0-3

Description: This course will examine perennial problems or themes in the history of philosophy through the medium of films. Topics we will explore: skepticism, personal identity, philosophy of mind, relativism, utilitarian and deontological ethics, the meaning of life, and the problem of evil. Counts for lower level Humanities-Social Science credit.

Offered: Fall 2022-2023

Requisites: Prereq: NE203 or 2/C standing.

Course: NP250

Title: LOGIC AND CRITICAL THINKING

Credits: 3-0-3

Description: First-rate officers need to be first-rate critical thinkers. Indeed, critical thinking is near the top of any list of skills needed for personal success, independence, self-understanding, and fulfillment in life. The primary objective of this course is to impart a functional ability to reason well--to improve your analytical skills and instincts (and thereby also your reading and writing skills), and to enhance your credibility as you demonstrate to others that you understand how reasoning works and that you can think rigorously, clearly, transparently, and self-critically. The course will develop your abilities to comprehend, analyze, and evaluate others' arguments, and to create strong arguments of your own. Counts for lower level Humanities-Social Science credit.

Offered:

Requisites: Prereq: 3/C or higher

Course: NP336

Title: PHILOSOPHY OF RELIGION

Credits: 3-0-3

Description: This course provides a focused introduction to philosophical questions that arise about religion and in the pursuit of religious ideals. Whether you are a person of strong faith from any religious tradition or an agnostic or an atheist, you will enjoy investigating and debating questions and topics such as these: Arguments for the Existence of God, Do Miracles Occur?, What is the Source of Evil?, What Happens When We Die?, Faith and Reason, Faith and scientific Knowledge, Religious Pluralism, and the Relationship Between Religion and Ethics. One way or another, these issues affect us all. Counts for Humanities-Social Science credit.

Offered: Fall, Spring

Requisites: Prereq: 1/C or 2/C or permission of department chair.

Course: NP340

Title: PHILOSOPHY OF SCIENCE

Credits: 3-0-3

Description: Everyone learns science from textbooks and tried-and-true lab experiments, but do you know how scientists really work? How they decide to count only certain things as "facts," and to regard only certain theories as "knowledge"? How they struggle to eliminate the subjective factor that is present in all human inquiry, in order to discover objective truths? In this course, you will examine these intriguing issues by reading some classic works of philosophers, historians, and sociologists of science; by comparing the processes of knowledge-generation in science with the analogous processes in other fields and in everyday life; and by studying specific current instances where the scientific information available to the public seems inadequate for enlightened decision-making. Leave behind the popular myths and stereotypes about scientists, and find out how their world really works! (*required for all General Science majors) Counts for Humanities-Social Science credit.

Offered: Fall 2022-2023

Requisites: Prereq: 1/C or 2/C or permission of department chair.

Course: NP410

Title: PHILOSOPHY OF WAR

Credits: 3-0-3

Description: This course will begin with a careful philosophical analysis of the concept of war and then proceed to a critical investigation of its moral permissibility. In so doing, we will consider such questions as: what distinguishes war from other forms of violence and coercion; whether offensive or defensive wars are ever justified; whether the use of military force for humanitarian ends is legitimate; what weapons, tactics and strategies may be employed in fighting a war, and against whom may such weapons, tactics and strategies be used? Counts for upper level Humanities-Social Science credit.

Offered: Fall 2022-2023

Requisites: Prereq: NE203.

Course: NP420

Title: PHIL FOUNDATIONS OF LIBERTY

Credits: 3-0-3

Description: Most of us believe that liberty is an important value. Indeed, many of us believe that it is the most important moral value. But we often do so without stopping to consider what liberty is and why we think it is so important. For example, is liberty the absence of something (interference) or the presence of something (control); is liberty something one necessarily wants more of or are there times when one might want less; can constraints on one's liberty be liberating or are they always limiting; should one be permitted to give up one's liberty or should one be forced to be free; does a commitment to individual liberty require a commitment to free markets or is a commitment to individual liberty compatible with other types of economic arrangements? Furthermore, what is the relationship between liberty and other things we value such as justice, equality, security, community, happiness and responsibility? Through the reading of classical and contemporary texts, this course will examine these and other related questions, not with the intent of achieving a final resolution, but rather with the intent of providing the student with a framework to thoughtfully consider and evaluate the relevant philosophical and moral issues. Emphasis throughout will be on class participation together with weekly writing assignments. Both a written mid-term and final examination will be given. Counts for upper level Humanities-Social Science credit.

Offered: Spring

Requisites: Prereq: NE203.

Course: NP430

Title: ETHICS AND IRREGULAR WARFARE

Credits: 3-0-3

Description: The War on Terror has seen American personnel resorting to the nightmare palette of harsh responses to terrorism and insurgency: assassination, torture, secret detention, military tribunal. This course will seek answers to the moral questions occasioned by the last decade of war. How can a state justly fight non-state actors employing terrorism and suicide attacks? Can there be a just insurgency? How can terrorism suspects be interrogated in a morally upright manner? Does torture work? Should irregular fighters like al-Qaeda operators get POW status or should they be treated as common criminals? Should they get civilian trials? Should they be Mirandized? Curriculum will include philosophical, historical, legal, and journalistic texts. Counts for upper level Humanities-Social Science credit.

Offered: Fall 2022-2023

Requisites: Prereq: NE203

Course: NP440

Title: STOIC PHILOSOPHY AND LEADERSHIP

Credits: 3-0-3

Description: This course will begin with a philosophical analysis of the Stoic claim that "Excellence is good, vice is evil, and all else is indifferent." In so doing, we will explore questions about the nature of harms, emotions, knowledge, and fate, both from the Stoic perspective as well as from the perspectives of their philosophical heroes and their philosophical rivals. Throughout the course, we consider how this ancient school of thought ought to influence one's life as a midshipman and as an officer. Counts for upper level Humanities-Social Science credit.

Offered: Spring

Requisites: Prereq: NE203

Seamanship and Navigation Department Courses (NN, NS)

Course: NN220

Title: BASIC NAVIGATION

Credits: 1-2-2

Description: A comprehensive introduction to basic navigation concepts, voyage planning, and contact tracking on maneuvering boards. The course objective is to develop skills in the practical uses of the navigation chart. Midshipmen are introduced to the nautical chart format and associated plotting tools and techniques, learning the concepts of chart coordinates by measuring and calculating distances, times, directions, and speeds. Navigation rules and maneuvering boards from NS101 are reinforced. 108 foot Yard Patrol (YP) craft provide hands-on experience for navigating in and out of harbors.

Offered: Summer 2022-2023, Fall 2022-2023

Requisites: Prereq: NS101 (3/C standing).

Course: NS300

Title: ADVANCED NAVIGATION

Credits: 1-2-2

Description: A comprehensive introduction to electronic and celestial navigation topics. Midshipmen will use Navy-approved systems such as Voyage Manage System (VMS) and STELLA for hands-on learning during labs. This course will build upon the foundation of navigation and seamanship skills established in NS101 and NN220, reinforcing and expanding upon topics such as voyage planning, time zones, Rules of the Road, maneuvering boards, and Bridge Resource Management.

Offered: Summer 2022-2023, Fall 2022-2023

Requisites: Prereq: NN220 (2/C standing).

Course: NS101

Title: FUNDAMENTALS OF SEAMANSHIP

Credits: 1-2-2

Description: This course provides the basic maritime background in general ship characteristics, ship handling, and international and inland navigational rules (i.e. Rules of the Road). Includes at-sea labs on 108 foot Yard Patrol (YP) Craft and shore-based simulator labs, providing midshipmen with hands-on experience navigating in and out of harbors, ship handling, and practical application of the navigation rules.

Offered: Fall 2022-2023

Requisites: Prereq: None (4/C standing).

Course: NS431

Title: JO PRACTICUM (SURFACE)

Credits: 1-2-2

Description: This course provides information about the duties and responsibilities required of a junior officer in the surface warfare community. Instruction includes operational procedures and practical applications of leadership and management principles tailored to the surface force. Labs include training in ship-handling and bridge watch-standing skills through the use of YPs and simulators. Additionally, this course examines naval doctrine, and the operational and tactical employment of naval forces. Those entering Surface Warfare or Supply Corps upon graduation are required to take this course.

Offered: Spring

Requisites: Prereq: Surface Warfare selectee (1/C standing).

Course: NS432

Title: JO PRACTICUM (SUBMARINES)

Credits: 1-2-2

Description: This course provides information about the duties and responsibilities required of a junior officer in the submarine warfare community. Instruction includes operational procedures and practical applications of leadership and management principles tailored to the submarine force. Topics include surfaced and submerged navigation, mission planning, and quality assurance. Additionally, this course examines naval doctrine, and the operational and tactical employment of naval forces. Those entering the Submarine Warfare community upon graduation are required to take this course.

Offered: Spring

Requisites: Prereq: Submarine Warfare selectee (1/C standing).

Course: NS433

Title: JO PRACTICUM (AVIATION)

Credits: 1-2-2

Description: This course provides information about the duties and responsibilities required of a junior officer in the aviation community. Instruction includes operational procedures and practical applications of leadership and management principles tailored to the aviation community. Topics include aviation training pipeline, the various naval aviation communities, squadron organization, division officer responsibilities and Naval Aviation Safety and Operating Procedures training. Additionally, this course examines naval doctrine, and the operational and tactical employment of naval forces. Those entering Navy Pilot, Naval Flight Officer, Intelligence, Cryptology, and Information Warfare communities upon graduation are required to take this course.

Offered: Spring

Requisites: Prereq: Aviation Warfare selectee (1/C standing).

Course: NS434

Title: JO PRACTICUM (USMC)

Credits: 1-2-2

Description: This course provides information about the duties and responsibilities required of a junior officer in the Marine Corps. Instruction includes operational procedures and practical applications of leadership and management principles tailored to the Marine Corps. Topics include tactics, techniques, procedures, organizational structure and practical applications of leadership. Particular emphasis is placed on combat and tactical decision-making to develop and enhance analytical skills and bias for action. Additionally, this course examines naval doctrine, and the operational and tactical employment of naval forces. Those entering the Marine Corps, and Civil Engineering Corps communities upon graduation are required to take this course.

Offered: Spring

Requisites: Prereq: US Marine Corps selectee (1/C standing).

Course: NS435

Title: JO PRACTICUM (SPECWAR)

Credits: 1-2-2

Description: This course provides information about the duties, responsibilities, and challenges facing a junior officer in the Naval Special Warfare (NAVSPECWAR) community. Instruction includes operational procedures and practical applications of leadership and management principles tailored to NAVSPECWAR. Topics include command structure, capabilities, future trends, small unit mission planning, land navigation, weapons-handling and decision making. Labs include instruction in small unit tactics and small boat handling skills. Additionally, this course examines naval doctrine, and the operational and tactical employment of naval forces. Those entering the Naval Special Warfare community upon graduation are required to take this course.

Offered: Spring

Requisites: Prereq: Special Warfare selectee (1/C standing).

Course: NS436

Title: JO PRACTICUM (EOD)

Credits: 1-2-2

Description: This course provides information about the duties and responsibilities required of a junior officer in the Special Operations/EOD community. Instruction includes operational procedures and practical applications of leadership and management principles tailored to the Special Operations community. Labs include dive locker training, underwater training and small boat handling skills in preparation for Dive School. Additionally, this course examines naval doctrine, and the operational and tactical employment of naval forces. Those entering the Special Operations/Explosive Ordnance community upon graduation are required to take this course.

Offered: Spring

Requisites: Prereq: Special Operations/EOD selectee (1/C standing).

Course: NS437E

Title: JO PRACTICUM (CEC)

Credits: 1-2-2

Description: This course provides information about the duties and responsibilities required of a junior officer in restricted line and staff corps communities. Instruction includes operational procedures and practical applications of leadership and management principles tailored to the specific communities. Course material is selected to provide advanced study in the fundamentals of the appropriate service communities. Those entering the Civil Engineering Corps should take this course.

Offered: Spring

Requisites: Prereq: CEC selectee & 1/C standing

Course: NS437I

Title: JO PRACTICUM (IDC)

Credits: 1-2-2

Description: This course provides information about the duties and responsibilities required of a junior officer in restricted line and staff corps communities. Instruction includes operational procedures and practical applications of leadership and management principles tailored to the specific communities. Course material is selected to provide advanced study in the fundamentals of the appropriate service communities. Those entering Intelligence, Cryptology, and Information Warfare communities should take this course.

Offered: Spring

Requisites: Prereq: Intelligence, Cryptology, or Information Warfare selectee & 1/C standing

Course: NS437M

Title: JO PRACTICUM (MEDICAL CORPS)

Credits: 1-2-2

Description: This course provides information about the duties and responsibilities required of a junior officer in restricted line and staff corps communities. Instruction includes operational procedures and practical applications of leadership and management principles tailored to the specific communities. Course material is selected to provide advanced study in the fundamentals of the appropriate service communities. Those entering Medical Corps should take this course.

Offered: Spring

Requisites: Prereq: Medical Corps selectee & 1/C standing

Course: NS437S

Title: JO PRACTICUM (SUPPLY CORPS)

Credits: 1-2-2

Description: This course provides information about the duties and responsibilities required of a junior officer in restricted line and staff corps communities. Instruction includes operational procedures and practical applications of leadership and management principles tailored to the specific communities. Course material is selected to provide advanced study in the fundamentals of the appropriate service communities. Those entering the Supply Corps should take this course.

Offered: Spring

Requisites: Prereq: Supply Corps selectee & 1/C standing

Physical Education Courses (PE)

Course: PE101

Title: PHYSICAL EDUCATION-BOXING/WRESTLING

Credits: 0-1-0

Description: Boxing/Wrestling

Offered: Fall 2022-2023

Requisites: Prereq: None.

Course: PE102

Title: PHYSICAL EDUCATION-SWIMMING

Credits: 0-1-0

Description: Swimming

Offered:

Requisites: Prereq: None.

Course: PE201

Title: PHYSICAL EDUCATION-3/C SWIMMING

Credits: 0-1-0

Description: Swimming

Offered: Fall 2022-2023

Requisites: Prereq: 3rd class midshipman.

Course: PE202

Title: PHYSICAL EDUCATION-PERSONAL CONDITIONING

Credits: 0-1-0

Description: The student will be able to understand fitness as a lifelong achievement by learning how to develop their own personal fitness plan that is adaptable to different environments and based off of their current fitness level. The student will also be able to demonstrate decision making when developing a nutrition plan that will encourage healthy eating habits throughout their Naval career.

Offered:

Requisites: Prereq: 3rd class midshipman.

Course: PE301

Title: PHYSICAL ED-2/C SWIMMING & PERS COND/WELLNESS

Credits: 0-1-0

Description:

Offered: Fall 2022-2023

Requisites: Prereq: 2nd class midshipman.

Course: PE302

Title: PHYSICAL EDUCATION-COMBATIVES

Credits: 0-1-0

Description: 8 weeks of "ground fighting" and 8 weeks of "compliance and strike techniques".

Offered:

Requisites: Prereq: 3rd class midshipman.

Course: PE402

Title: KAYAKING

Credits: 0-1-0

Description:

Offered: Fall 2022-2023

Requisites: Prereq: 1st class midshipman.

Course: PE403

Title: GYMNASTICS

Credits: 0-1-0

Description:

Offered: Fall 2022-2023

Requisites: Prereq: 1st class midshipman.

Course: PE404

Title: TENNIS

Credits: 0-1-0

Description:

Offered: Fall 2022-2023

Requisites: Prereq: 1st class midshipman.

Course: PE406

Title: VOLLEYBALL

Credits: 0-1-0

Description:

Offered: Fall 2022-2023

Requisites: Prereq: 1st class midshipman.

Course: PE407

Title: GOLF

Credits: 0-1-0

Description:

Offered: Fall 2022-2023

Requisites: Prereq: 1st class midshipman.

Course: PE408

Title: SQUASH

Credits: 0-1-0

Description:

Offered: Fall 2022-2023

Requisites: Prereq: 1st class midshipman.

Course: PE409

Title: FIRST AID

Credits: 0-1-0

Description:

Offered:

Requisites: Prereq: 1st class midshipman.

Course: PE410

Title: WEIGHT TRAINING

Credits: 0-1-0

Description:

Offered: Fall 2022-2023

Requisites: Prereq: 1st class midshipman.

Course: PE411

Title: RACQUETBALL
Credits: 0-1-0
Description:
Offered:
Requisites: Prereq: 1st class midshipman.

Course: PE414
Title: WATER POLO
Credits: 0-1-0
Description:
Offered:
Requisites: Prereq: 1st class midshipman.

Course: PE415
Title: PICKLEBALL
Credits: 0-1-0
Description:
Offered: Fall 2022-2023
Requisites: Prereq: 1C standing

Course: PE418
Title: ADVANCED BOXING
Credits: 0-1-0
Description:
Offered:
Requisites: Prereq: 1st class midshipman.

Course: PE420
Title: SWIMMING CONDITIONING
Credits: 0-1-0
Description:
Offered: Fall 2022-2023
Requisites: Prereq: 1st class midshipman.

Course: PE421
Title: FITNESS TESTING AND ASSESSMENT
Credits: 0-1-0
Description: This course introduces midshipmen to the components of fitness assessed in the different semi-annual physical fitness tests used by the military services. Additionally, students will learn and participate in several of the current as well as proposed alternative test events used by industry and the different military services.
Offered: Spring
Requisites: Prereq: 1/C standing

Course: PE434
Title: TRIATHLON
Credits: 0-1-0
Description:
Offered:
Requisites: Prereq: 1st class midshipman.

Course: PE450
Title: INTRODUCTION TO CLIMBING

Credits: 0-1-0

Description: Teaches introductory climbing techniques utilizing the artificial climbing wall. The curriculum includes lecture, demonstration and a great deal of hands-on application.

Offered: Fall 2022-2023

Requisites: Prereq: 1st class midshipman.

Course: PE460

Title: ADVANCED ROCK CLIMBING

Credits: 0-1-0

Description:

Offered:

Requisites: Prereq: 1/C standing and (PE350 or PE450).

Course: PE462

Title: MARTIAL ARTS I - USMC PROGRAM

Credits: 0-1-0

Description: An advanced martial arts class for midshipmen who have successfully completed Combatives. The course teaches advanced martial arts techniques and leads to USMC certification as a Tan Belt.

Offered: Fall 2022-2023

Requisites: Prereq: 1C and successful completion of Combatives.

Course: PE463

Title: MARTIAL ARTS II - USMC PROGRAM

Credits: 0-1-0

Description: Offers advanced Martial Arts training, leading to belts of certification recognized by the Marine Corps Martial Arts Program.

Offered:

Requisites: Prereq: PE462 or approval by the PE Martial Arts Committee Chairman.