

Division of Mathematics and Science

Chemistry Department

Computer Science Department

Mathematics Department

Oceanography Department

Physics Department





Chemistry Department

Chemistry Major

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 required courses in organic, inorganic, analytical and physical chemistry and biochemistry. In addition to the required courses, midshipmen may take advanced courses in each of these subject areas along with related areas such as polymer chemistry, explosives and propellants, forensics and environmental chemistry. Senior capstone or research projects enable midshipmen to investigate topics of particular interest to them under the guidance of a faculty member.

Chemistry is an experimental science, and many hours are devoted to laboratory work. The chemistry department at the Naval Academy has one of the finest undergraduate chemistry laboratory facilities in the nation, with modern spaces and a wide array of instrumentation. Skilled technicians maintain the laboratories, assist the faculty and help midshipmen solve practical problems in the labs. Faculty has a wealth of experience, not only in their academic understanding of chemistry but also in the practical application of chemistry in the Navy and Marine Corps. Chemistry majors will find that their civilian and military instructors can make the study of chemistry a highlight of their learning experience at the Naval Academy.

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.

Curriculum Requirements (In addition to the requirements of plebe year)

Professional: NE203, NN210, NL310, NN310, NL400, NS43X;

Mathematics: SM223, SM212;

Science: SP211, SP212;

Humanities: HH2XY, HH216 and two electives including one at the 300/400 level;

Engineering: EE301, EE310, EM300, ES300, ES360, EA/N4XY;

Major: SC216, SC225, SC226, SC261, SC262, SC335, SC345, SC361, SC346, SC356, SC364, SC472, SC476 or SC496, two major electives, and one free elective.

[Chemistry courses](#)



Computer Science Department

Computer Science Major

The Computer Science major provides a strong foundation in the main areas of the discipline and leads to a bachelor of science in computer science.

The academy's computer science program affords an exciting and challenging curriculum that meets the needs of newly appointed naval officers serving in the fleet's operational forces. The program includes core courses in programming, data structures, computer organization, and networks. It also incorporates courses focused on program performance and efficiency, programming languages, as well as applications in artificial intelligence, graphics, and robotics. The major curriculum lays strong theoretical and practical foundations, and gives midshipmen the flexibility to explore topics that range from the classical to the cutting edge. The computer science program concludes with a capstone project chosen by each midshipman major for further, in depth research.

The computer science major is accredited by the Computing Accreditation Commission of ABET, <http://www.abet.org>.

The Computer Science Department has several well-equipped, cutting-edge laboratories: three general purpose labs housing small form factor desktop PCs; two labs equipped with dual-boot capability workstations that support both Windows and UNIX operating system environments; and two labs supporting Information Assurance and Networking courses. These latter two are configured with isolated networks that allow midshipmen to explore and experiment with network security. Finally, a robotics laboratory contains manipulator arms, vision systems, desktop computers and mobile robots used for a variety of hands-on projects. These labs support both the Computer Science and Information Technology programs.

Today's Navy and Marine Corps require junior officers with the highest levels of technical expertise and professional competence. Departmental graduates in computer science will be well-prepared for the challenges of rapidly evolving computer technologies they can expect to encounter in their Navy and Marine Corps careers.

Curriculum Requirements (In addition to the requirements of plebe year)

Professional: NE203, NN210, NN310, NL310, NL400, NS43X;

Mathematics: SM223, SM242;

Science: SP211, SP212;

Humanities: HH2XY, HH216 and two electives, including one at the 300/400 level;

Engineering: EE301, EM300, ES300, ES360, EA/N4XY;

Free elective;

Major: IC210, IC211, IC220, IC221, IC312, IC322, SI340, SI335, SI413, IC470, IC480, and three major electives.

[Computer Science courses](#)



Information Technology Major

The Information Technology major prepares midshipmen as critical catalysts for tomorrow's naval service, serving as leaders in a network centric world and experts in leveraging leading edge technology to solve operational problems. IT majors bridge the gap between technology and its use in the Navy.

The Information Technology program is accredited by the Computing Accreditation Commission of ABET, <http://www.abet.org>.

Students in this program develop a broad base of competencies in software, hardware, and the management of technology. The program begins by providing majors with a strong foundation in the classical computer science core competencies including programming, computer architecture, data structures and software design. The students then focus their studies on internet operations and web applications, information assurance and network security, data management and human-computer interaction. The culmination of their educational experience is a capstone project which brings together all aspects of the students' IT and Naval Academy education and provides a rewarding opportunity for collegial mentorship for both faculty and students. Upon graduation, the majors will be awarded a bachelor of science in information technology.

The eight modern computing laboratories housed in the Computer Science Department include three general purpose labs equipped with desktop PCs, two labs equipped with workstations with dual-boot capability, supporting both Windows and UNIX operating system environments, two labs configured with isolated networks that allow midshipmen to explore and experiment with network security, and a robotics laboratory equipped with vision systems, desktop computers and mobile robots. These labs support both the Information Technology and Computer Science programs.

Curriculum Requirements (In addition to the requirements of plebe year)

Professional: NE203, NN210, NN310, NL310, NL400, NS43X;

Mathematics: SM223, SM242;

Science: SP211, SP212;

Humanities: HH2XY, HH216 and two electives including one at the 300/400 level;

Engineering: EE301, EM300, ES300, ES360, EA/N4XY;

Free elective;

Major: IC210, IC211, IC220, IC221, IC312, IC322, IT350, IT360, IT430, IC470, IC480, and three major electives.

[Information Technology courses](#)



Mathematics Department

Mathematics Major

The mathematics major (<http://www.usna.edu/MathDept>) teaches logical and critical thinking; fundamental abilities that are invaluable to Naval and Marine Corps officers. Mathematics plays a central role in virtually every technical and scientific field and is crucial in developing and applying modern, accurate models used to evaluate systems and tactics in all phases of the modern battlefield. Mathematics majors learn to analyze problems, formulate solutions, and express results in a clear and precise manner. These same skills are applied aboard a ship or submarine, inside a fighter jet or on the ground. The mathematics major also provides an excellent foundation for graduate work in any technical field as well as in business or law. Two tracks are offered: Applied Mathematics and Mathematics. A bachelor of science degree is awarded.

Elective courses offer the opportunity to study a wide variety of topics such as operations analysis, fluid flows, cryptography, chaos, wavelets, fractals, target motion analysis, submarine tactics, elliptic curves, computer arithmetic, and geometric tomography for medical diagnosis. The mathematics honors program allows selected students to do in-depth research in such fields. The Mathematics Department consists of about 60 faculty members who are actively engaged in teaching and research. About 20 military officers on the faculty bring first-hand experience in applying mathematics and mathematical thinking to specific Naval and Marine Corps problems. The civilian faculty devotes substantial time to current research in various specialty fields in pure and applied mathematics, as well as in operations research.

Curriculum Requirements (In addition to the requirements of plebe year)

Professional: NE203, NL310, NL400, NN210, NN310, NS43X;

Science: SP211, SP212;

Humanities: HH2XY, HH216, and two electives including one at the 300/400 level;

Engineering: EA400 or EN400 or EN401, EE301, EE310, EM300, ES300, ES360;

One mathematics, science, or engineering elective;

Mathematics: SM221, SM222;

Major - Both Tracks: SM261, SM280, SM233, SM291, SM239, SM331;

Free elective.

Applied Mathematics Track: SM365, SM339, applied mathematics capstone course, three applied mathematics track electives (at least one at the 400 level), one additional major elective.

Mathematics Track: SM3625, SM334 or SM411 or SM461 or SM462, mathematics capstone course, two mathematics track electives, two additional major electives (at least one at the 400 level).

[Mathematics courses](#)

Operations Research Major

Operations Research is a modern, interdisciplinary subject that uses mathematical techniques to solve large-scale optimization problems in the real world. The field grew out of urgent problems faced by the Allies during World War II and helped guide military planners in their decision-making. For example, operations research showed that to minimize the losses of trans-Atlantic shipping to German U-Boats it was better to use a small number of large convoys rather than a large number of small convoys. After the war, operations research extended its influence to all logistical and scheduling problems in the military. Civilian applications also proliferated. For instance, the synchronization of stop-lights for smooth traffic flow throughout a city is an important type of problem in operations research. Also, major league baseball and other professional sports leagues hire consultants specializing in operations research to construct the schedule for each season.

In addition to traditional operations research courses, such as linear programming and simulation, Midshipmen majoring in Operations Research (SMO) will also take traditional mathematics courses in probability, statistics, and matrix theory as well as operations research courses applied to military problems (Search and Detection Theory).

In addition to the usual opportunities such as summer internships and Trident Scholars, majors in operations research will have the opportunity to conduct a capstone study that may directly benefit the Naval Service. After graduation, the major will provide a strong foundation for graduate study in Operations Research at the Naval Postgraduate School in Monterey, CA, or at a civilian graduate school. Individuals trained in Operations Research are in high demand both in the Naval Service, for example in the Assessment Division, Office of the Chief of Naval Operations (N81) or at the Marine Corps Combat Development Command (MCCDC) and in civilian consulting firms, such as Booz Allen Hamilton (BAH).

The SOR major requires some technical writing skills and uses the computer as a major tool. A midshipman who enjoys solving math problems and puzzles, who is comfortable using the computer as a tool and who is interested in using math skills to solve real-world problems should be successful and happy pursuing a major in operations research.

Curriculum Requirements (In addition to the requirements of plebe year)

Professional: NE203, NL310, NL400, NN210, NN310, NS43X;

Science: SP211, SP212;

Humanities: HH2XY, HH216, and two electives including one at the 300/400 level;

Engineering: EA400 or EN400 or EN401, EE301, EE310, EM300, ES300, ES360;

Mathematics: SM223, SM239;

Major: SM261, SM280, SM233, SM339, SA305, SA402, SA405, SA410, SA421, SA475, two breadth electives, one math elective and two track electives;

Free elective.



General Science Major

The general science major provides training in a broad, scientifically oriented program. Course work is drawn from each of the departments in Math and Science division. The major consists of an interdisciplinary program without the need for specialization. A bachelor of science degree is awarded.

Curriculum Requirements (in addition to the requirements of plebe year)

Professional: NE203, NL310, NL400, NN210, NN310, NS43X;

Mathematics: SM221 or SM223, SM230;

Science: SP211, SP212;

Humanities: HH215, HH216 and two electives including one at the 300/400 level;

Engineering: EA400 or EN400 or EN401, EM300, EE301, EE310, ES300, ES360;

Major: NP340, SA302, SB211, SI200, SM212, SO231, SO244, SP301, SP411, two mathematics, science or engineering electives and two free electives.



Quantitative Economics Major

The major in quantitative economics is interdisciplinary, focusing on applications of mathematics to economic problems. Students are provided with a broad set of mathematical tools and a solid background in economic theory. About half the courses are taken in economics and half in mathematics. The major is jointly administered by the Departments of Mathematics and Economics. A bachelor of science degree is awarded.

Curriculum Requirements (in addition to the requirements of plebe year)

Professional: NE203, NL310, NL400, NN210, NN310, NS43X;

Mathematics: SM223, SM239;

Science: SP211, SP212;

Humanities: HH2XY, HH216 and two electives including one at the 300/400 level;

Engineering: EA400 or EN400 or EN401, EM300, EE301, EE310, ES300, ES360;

Free Elective;

Major: FE210, FE312, FE341, FE445, SM261, SM279, SM339, SA401, SA475E, and five major electives.



Oceanography Department

Oceanography Major

The oceanography major gives future naval officers practical and theoretical knowledge of the ocean environment and builds a sound academic foundation for future graduate study in any technical discipline. An interdisciplinary science major, oceanography involves the study of meteorology, geophysics, physics, chemistry, biology and geology as they relate to the ocean environment.

Basic courses in these areas are prerequisites for more advanced oceanography and meteorology courses. Students take courses in sound propagation in the ocean, the study of waves and tides, and the use of satellites in oceanography. A course in advanced biological oceanography offers a glimpse of the undersea world and its marine creatures; synoptic meteorology courses involve hands-on weather forecasting experience using the latest tools available. More than 25 percent of the required course load is within the oceanography specialty. Other courses include advanced mathematics, necessary to describe the complex behavior of fluid environments. A bachelor of science degree is awarded. An honors program with a designated honors degree is available for selected students.

The Naval Academy boasts the most extensive undergraduate oceanographic facilities in the country. Located on a pier adjacent to the mouth of the Severn River, the Hendrix Oceanography Laboratory is a multi-function enclosure featuring a wet laboratory where students study our nation's largest estuary, the Chesapeake Bay. The academy's oceanographic research vessel enables midshipmen to collect samples and oceanographic data afloat and deliver them to the department's shore labs, and midshipmen have the opportunity to participate in a three-week oceanography cruise aboard this vessel during the summer training period. Classroom laboratories in Chauvenet Hall house the introductory and advanced oceanography and meteorology labs, a biological oceanography lab, and a remote sensing/geographic information systems lab. The advanced meteorology laboratory has an on-line receiver to display charts from the National Oceanic and Atmospheric Administration and the Naval Meteorology and Oceanography Command, direct access to the World Meteorological Organization's data network, and a color weather radar display, all of which can be accessed via computer workstations. Students use all of these facilities in required courses as well as in their electives.

Curriculum Requirements (In addition to the requirements of plebe year)

Professional: NE203, NL310, NL400, NN210, NN310, NS43X;

Mathematics: SM221, SM212, SM415;

Science: SP211, SP212, SP411;

Humanities: HH215, HH216, and two electives, including one at the 300/400 level;

Engineering: EN400 or EN401 or EA400, EM300, EE301, EE310, ES300, ES360;

Free Elective;

Major: SO231, SO234, SO244, SO335, SO345, SO414, SO416, SO470x, plus three major electives.

[Oceanography courses](#)



Physics Department

Physics Major

The study of physics joins a set of physical laws and definitions with the integrative reasoning essential for modeling and solving real-world problems. The physics major provides a strong foundation for further work in a broad range of technical fields through study of fundamental physical concepts and development of students' experimental techniques. In addition to the traditional physics track, an astrophysics track (SPAA) and an applied physics (SPA) track are available. The astrophysics track focuses on the study of physics in the context of astronomy and cosmology, and includes an introduction to observational techniques. The applied track encompasses applications of physics in the other engineering and science disciplines. The bachelor of science degree is awarded.

The theory of relativity, mechanics, electromagnetism, quantum mechanics, field concepts, and the origin, propagation and reception of waves (of all kinds) are among the topics physics majors master. The goal throughout is developing an open-minded, creative, and analytical approach to the physical world and to problem-solving in general.

Midshipmen majoring in physics have access to eight advanced laboratories. Specialties within the department are: underwater and physical acoustics, astronomy and astrophysics, computational physics, laser optics and photonics, nanoscopic and macroscopic solid state physics, accelerator-based nuclear and particle physics, and theoretical physics.

The physics major is excellent background for virtually all career paths in the U.S. Navy and Marine Corps. Recent graduates have chosen the Navy's nuclear power, aviation, and surface line communities, as well as both the ground and aviation components of the Marine Corps. Opportunities for work towards advanced degrees are available to qualified physics majors prior to graduation, immediately after graduation, and later in their careers.

Curriculum Requirements (In addition to the requirements of plebe year)

Professional: NE203, NL310, NL400, NN210, NN310, NS43X;

Mathematics: SM212, SM221;

Humanities: HH215, HH216 and two electives including one at the 300/400 level;

Engineering: EE301, EE310, EA400 (or EN400 or EN401), EM300, ES300, ES360, mathematics, science or engineering elective;

Major: SP221, SP222, SP226, SP324, SP327, SP333, SP342, SP351, SP352, SP425, SP444, plus two physics electives;

Applied Physics Track: replace SP425 and SP444 and two physics electives with four additional electives approved by the Director of the Applied Physics Track.

Astrophysics Track: replace SP425, SP444 and two additional electives with SP310, SP445, SP446 and SP447.

Other: Math/Science/Engineering elective and one free elective.

[Physics courses](#)