



College of Engineering and Applied Sciences

Stony Brook University is one of America's most dynamic public universities and a magnet for outstanding students, offering more than 200 Bachelor programs, 100 master's programs and 40 doctoral programs. From its beginnings more than a half-century ago, Stony Brook University has been characterized by innovation, energy, and progress, transforming the lives of people who earn degrees, work, and make groundbreaking discoveries here.

Stony Brook is one of only 62 members of the prestigious, invitation-only Association of American Universities. Stony Brook University is ranked one of the nation's top 100 Universities and top 40 public universities by *U.S News & World Report*, and is consistently named one of the best values among public universities by *Kiplinger's Personal Finance*.

www.stonybrook.edu/admissions



Priority Application Deadline:
January 15

E-mail: enroll@stonybrook.edu
Phone: (631) 632-6868

Whether you aspire to be an applied mathematician, computer scientist, engineer, or technical project manager, Stony Brook University's College of Engineering and Applied Sciences (CEAS) can provide you with a solid foundation for your future. CEAS is home to 160 faculty who are experts in their respective fields of research, along with over 5,300 students in the fall of 2015.

At Stony Brook, we encourage and prepare you to become a lifelong learner. The critical thinking skills and invaluable experience of teamwork and intellectual dialogue that will mark your four years at Stony Brook will remain with you forever. Our graduates not only weather the change, but lead the way through change.

UNDERGRADUATE MAJORS, MINORS, AND ACCELERATED-DEGREE PROGRAMS

Applied Mathematics & Statistics

BS, BS/MS, BS/MBA,
BS/MPH, Minor, MS, PhD

Bioengineering *Minor*

Biomaterials *Minor*

Biomedical Engineering*

BE, BE/MS, MS, PhD

Chemical & Molecular Engineering*

BE, BE/MBA

Civil Engineering

BE, MS, PhD

Computer Engineering*

BE, BE/MS, MS, PhD

Computer Science**

BS, BS/MS, BS/MBA, MS, Minor, PhD

Electrical Engineering*

BE, BE/MS, BE/MBA, MS, Minor, PhD

Electronic, Optical, & Magnetic Materials *Minor*

Engineering Composites *Minor*

Engineering Science* BE, BE/MS

Engineering & Technology Entrepreneurship *Minor*

Environmental Engineering *Minor, PhD*

Information Systems BS, BS/MBA, Minor, MS

Manufacturing Engineering *Minor*

Materials Science *Minor, MS, PhD*

Mechanical Engineering* BE, BE/MS, MS, Minor, PhD

Nanotechnology Studies *Minor*

Technological Policy & Innovation *PhD*

Technological Systems Management BS, BS/MS *Minor, MS*

** Accredited by the Computing
Accreditation Commission of ABET,
www.abet.org.

* Accredited by the Engineering A
ccreditation Commission of ABET,
www.abet.org.

EXTRAORDINARY RESEARCH OPPORTUNITIES

Our faculty are top scientists and engineers who conduct cutting-edge research and write your textbooks. Through the senior design projects in the engineering programs, the software design project in computer science, or the interdisciplinary senior project in technological systems management, you will learn project design, planning, modeling, and execution. In addition, you can conduct original research through the Research Experiences for Undergraduates Program and the Undergraduate Research and Creative Activities Program. Additional research opportunities exist at nearby Brookhaven National Lab, which Stony Brook co-manages, and at our Centers for Advanced Technology.

VALUABLE INTERNSHIP EXPERIENCE

To help you explore career paths and get the experience employers want, CEAS works closely with the University Career Center to receive participating companies' internship requirements, review student records and verify academic qualifications, and forward applications to internship employers. Internships are available with local companies, as well as national or multinational companies such as, Goldman Sachs, Google or 3M.

WOMEN IN SCIENCE & ENGINEERING (WISE)

WISE is a unique program designed to encourage talented freshman women interested in math, science, or engineering. WISE offers special enrichment

courses, extracurricular activities and interaction with other like-minded women – both students and faculty. With a limited number of students admitted each year, WISE can offer you scholarships, special classes, early research opportunities at Brookhaven National Lab, personalized academic advising, and small study groups to put you at the heart of a community where you can excel.

BE/MD PROGRAM

The Engineering Scholars for Medicine Program is a highly selective BE/MD program for freshman applicants who wish to pursue interests in engineering and the medical field. Students accepted into this programs are guaranteed admission to Stony Brook University's School of Medicine, provided they satisfy certain conditions.

HONORS PROGRAM IN COMPUTER SCIENCE

The Honors Program in Computer Science is a highly selective academic program within the Computer Science major. To be admitted, students must demonstrate overall academic excellence. Honors course offerings include small accelerated introductory course sequences in programming and in the foundations of computing, advanced courses on selected topics, and a senior honors project. Honors students with a grade point average of 3.50 at the end of the junior year will be automatically approved for admission to the five-year accelerated BS/MS program in computer science.

ACCELERATED DEGREE PROGRAMS

Stony Brook's College of Engineering and Applied Sciences offers a number of accelerated bachelor/master degree programs, which allow students to use graduate credits taken as an undergraduate toward both the undergraduate and graduate degrees, thus reducing the normal time required to complete a master's degree. When you enroll in one of our many accelerated degree programs, you'll fast-forward your future.

DEPARTMENTAL MINORS PROGRAMS

The Honors Programs in Biomedical, Computer, and Electrical Engineering provide high achieving students an opportunity to receive validation for a meaningful research experience and for a distinguished academic career.

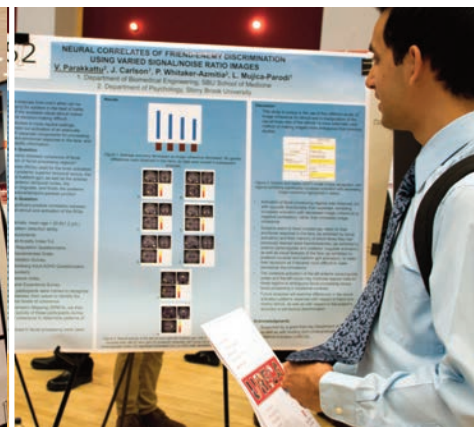
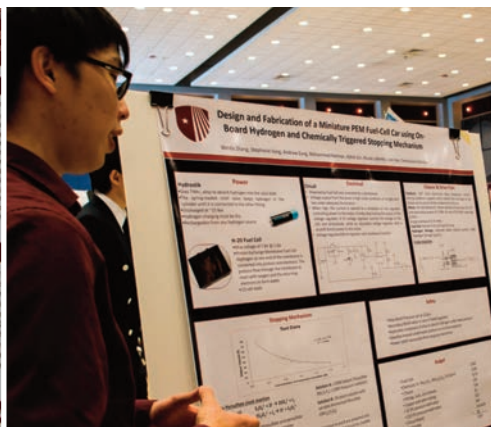
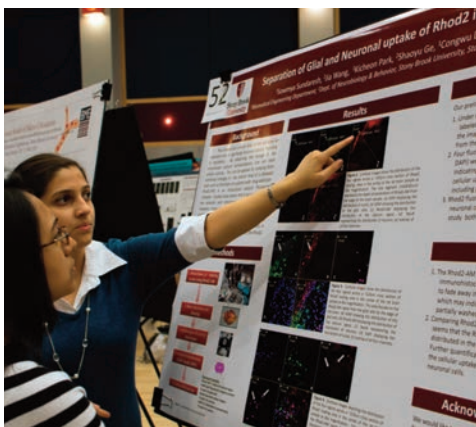
Applied Mathematics and Statistics

Major (BS), BS/MS, BS/MBA, BS/MPH, Minor, MS, PhD
Department of Applied Mathematics & Statistics

www.ams.stonybrook.edu

As reported in USA Today, the undergraduate applied mathematics program at Stony Brook University is the fourth best in the country, with reputation for providing students with an excellent education highlighted by small class sizes and research opportunities.

Stony Brook's Department of Applied Mathematics and Statistics is unique among leading research universities in providing a single unified academic home for applied mathematics, statistics



and operations research. The department offers a major focusing in core areas of mathematics, including calculus, linear algebra, and discrete mathematics, with opportunities to study computational biology, quantitative finance and operations research.

The major prepares graduates for quantitative careers in business. About half of the program's majors enter graduate or professional programs, primarily in statistics, operations research, computer science, business, and financial engineering. Others go directly into professional careers as actuaries, programmer analysts, management trainees, and secondary school teachers. Employment opportunities exist in government, industry, and the financial sector. One popular career is actuarial science. Many of the program's courses cover material on the actuarial exams, and there is an additional review course for the first actuarial exam.

Bioengineering

Minor

Department of Biomedical Engineering
www.bme.stonybrook.edu

The Bioengineering minor is designed for Biology and Biochemistry majors who wish to obtain a more thorough understanding of how physical forces in the natural world influence biological systems. Coursework introduces these concepts and shows how an engineering approach can be useful in dealing with questions in biology and medicine. The program serves as an excellent background for students who wish to prepare for graduate study in bioengineering or a related field, or for a career in which an understanding of engineering concepts would provide an advantage.

Biomaterials

Minor

Department of Materials Science & Engineering
www.matscieng.sunysb.edu

The Biomaterials minor is designed for students enrolled in Bachelor of Engineering (BE) degree programs who wish to obtain an understanding of how materials interact with the human body

and how engineering materials can be designed to serve physiological functions. The minor includes a comprehensive selection of courses in materials science, biomechanics, and biology, as well as study of fluids and electricity as they relate to human physiology.

The program serves as an excellent background for engineering students who wish to prepare for graduate education in medicine, bioengineering, and the biosciences or a related field, or for a career in which an understanding of biological concepts is essential.

Biomedical Engineering

Major (BE), BE/MS, MS, PhD

Department of Biomedical Engineering
www.bme.stonybrook.edu

The Biomedical Engineering major provides an engineering education, along with a strong background in the biological and physical sciences. It is designed to enhance the development of creativity and collaboration through study of a specialization within the field of biomedical engineering. Areas of specialization include: Biomechanics, Biomaterials, Bioelectricity/Bioimaging, and Molecular and Cellular Biomedical Engineering. Teamwork, communication skills, and hands-on laboratory and research experience are emphasized.

The curriculum provides students with the underlying engineering principles required to understand how biological organisms are formed and how they respond to their environment. Core courses provide depth within the broad field of biomedical engineering.

Biomedical engineers design and develop materials, processes, and devices to prevent, diagnose, and treat disease, to rehabilitate patients, and to generally improve health. Stony Brook's graduates prepare for professions in biomedical engineering, biotechnology, pharmaceuticals, medical technology, academia, and government. Potential employers include colleges and universities, hospitals, government, research institutes and laboratories, and private industry.

Chemical & Molecular Engineering

Major (BE), BE/MBA

Department of Materials Science & Engineering
www.matscieng.sunysb.edu

This program meets the expanding demand for chemical engineers in the nanotechnology, nutraceutical, pharmaceutical, environmental, and energy industries. It emphasizes engineering at the molecular level rather than traditional large-scale process engineering.

The program provides students with knowledge in the basic physical sciences, mathematical techniques, and computational modeling tools that form the foundation of modern chemical and molecular engineering. Courses prepare students to solve complex problems involving scientific, ethical, and moral considerations, and to communicate effectively as members of interdisciplinary teams. Students can specialize in areas such as Pharmacology, Materials Science, Polymer Science, Tissue Engineering, and Business. Industrial and research-oriented internships are emphasized.

Employment opportunities for graduates of the program include high technology industries and institutions engaged in research and manufacturing related to nanotechnology, pharmaceuticals, biotechnology, future fuels, waste management, and the synthesis of new materials.

Civil Engineering

Major (BE)

Department of Civil Engineering
www.stonybrook.edu/civil

The Civil Engineering degree prepares students with both breadth and depth in technical knowledge so that they can work immediately in most areas of the profession, including: geotechnical engineering; environmental engineering; hydraulics; structural engineering; construction management; and transportation/traffic engineering.

The undergraduate program offers a balanced approach to civil engineering education. Our civil engineering courses

teach students the fundamentals of engineering design, as well as potential applications. Students are taught how to use computer software to expedite the design process, and they are also taught how to balance engineering designs with economic constraints.

Students take a common core of civil engineering courses, and choose from one of the following tracks to complement their depth requirement in Civil Engineering:

- Transportation Engineering
- Geotechnical Engineering
- Water Resources & Environmental Engineering
- Structural Engineering & Construction Materials

The program is also designed to give students a solid foundation in engineering and science. Students take courses in chemistry, physics, and math, in addition to a core set of engineering courses common to most engineering disciplines. During their senior year, undergraduate students work under supervision on a two-semester design project.

Computer Engineering

Major (BE), BE/MS, MS, PhD
Department of Electrical and Computer Engineering
www.ece.stonybrook.edu

Computers in the form of microprocessors or microcontrollers are an integral component in almost all modern electronic systems, including those in automobiles, appliances, medical instrumentation, manufacturing automation, consumer electronics, and avionics. Microcontroller-based systems will play a critical role as society transitions to a “green” economy.

Computer Engineering is based on mathematics, physics, circuit theory, electronics, digital systems, and computer science, and includes the study of embedded microprocessor system design, computer architecture, software engineering, operating systems, and software tools.

Students are prepared for professional careers or graduate studies in the electrical and computer engineering fields. The cur-

riculum provides a solid education in the fundamentals of computer engineering, digital hardware and software, engineering science, engineering design, mathematics, and the natural sciences.

Computer Science

Major (BS), BS/MS, BS/MBA, Minor, MS, PhD

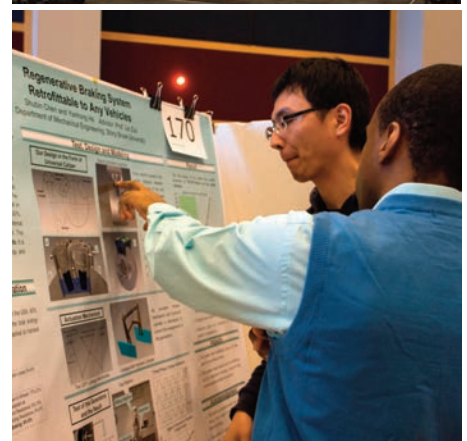
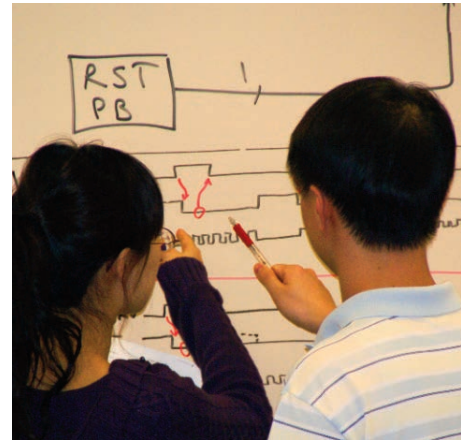
Department of Computer Science
www.cs.stonybrook.edu

Computer science is the study of computer systems, including computer architecture, software development, information processing, computer applications, algorithmic problem-solving, and mathematical foundations. The National Research Council ranked the computer science program at Stony Brook among the nation's top 20 based on research productivity, student support and outcomes.

Students study programming, database systems, software engineering, artificial intelligence, computer architecture, scientific visualization, mobile computing, multimedia, and computer graphics. They are prepared to develop software systems for diverse applications in advanced energy, business, healthcare, telecommunications, internet technology, and financial services.

Students majoring in Computer Science have the opportunity to pursue one of four different specializations: human-computer interaction, game programming, information assurance, and systems software development.

Many students prepare for their professional careers through internships at major corporations, as well as local start-up firms. Career opportunities include developing software systems for a diverse range of applications such as: user interfaces; networks; databases; forecasting; web technologies; and medical, communications, satellite, and embedded systems.



Electrical Engineering

Major (BE), BE/MS, BE/MBA, Minor, MS, PhD

*Department of Electrical and
Computer Engineering*
www.ece.stonybrook.edu

With the explosion of growth in the high-tech industry, the definition of what it means to be an “electrical engineer” has expanded. Electrical engineering is central to the fast-growing industries of communications, computers, lasers, electro-optics, robotics, and consumer electronics. Current growth areas include telecommunications, signal processing, optoelectronics, microelectronics, pattern recognition, machine vision, artificial intelligence, and robotics.

Students apply fundamental scientific and mathematical principles to learn about the design of communication systems, signal processing, control systems, semiconductor electronics, circuits, microprocessors, and instrumentation. The program provides a sequence of laboratory and design courses and the opportunity to engage in research and industrial projects with faculty.

Students are prepared for professional careers or graduate studies in the electrical engineering field. Development of non-technical skills such as communication and teamwork is emphasized. Electrical Engineering students may follow the general track, or choose a specialization in microelectronics or telecommunications.

Electronic, Optical, & Magnetic Materials

Minor

*Department of Materials Science
& Engineering*
www.matscieng.sunysb.edu

The minor in Electronic, Optical, and Magnetic Materials is for students who seek to obtain a more thorough understanding of the engineering sciences. Emerging technologies in wireless communication, data storage and transmission, sensors, medical diagnostics, and semiconductor manufacturing require graduates with an

understanding of electronics design, electromagnetic theory, and electronic and magnetic materials. The courses in the minor provide the student with a broad introduction to the engineering science principles and applications associated with electronic, optical, and magnetic materials.

Engineering Composites

Minor

Department of Mechanical Engineering
me.eng.stonybrook.edu

The minor in Engineering Composites is available to students who seek a strong education in the mechanical behavior of composite materials. This major is intended for students with a strong background in engineering or physical science. Engineering composites are used widely in many industries including aerospace, civil, naval, medical, and automotive; examples can be seen in aircraft, yachts, motor vehicles, dental fillings and a wide range of military equipment.

This minor will provide the students with the background as well as the analysis and design methods to provide a foundation for using engineering composites effectively. To fulfill this outcome, three main topics will be addressed: 1) Theoretical background, analysis and design; 2) Fabrication; and 3) Characterization. Students will learn how to fabricate composites, experimentally measure their relevant mechanical properties, and incorporate them into engineering designs. Students will gain invaluable insight into engineering composites, give them a competitive edge in an engineering market that is becoming increasingly dependent on engineering composites.

Engineering Science

Major (BE), BE/MS

*Department of Materials Science
& Engineering*
www.matscieng.sunysb.edu

Engineering Science reflects the multidisciplinary nature of 21st century engineering. The sequence of design and technical courses prepares students for careers in a variety of engineering-based

industries, including communications, computing, biomaterials, and aerospace.

The first two years of the program provide students with a foundation of scientific and mathematical skills. During the next two years, students choose one of seven specializations: biotechnology, manufacturing engineering, electronics engineering, materials science and engineering, civil and environmental engineering, nanoscale engineering, and engineering management.

The program provides an engineering education that covers fundamental aspects of engineering design, physical and chemical sciences, mathematics, and materials science and engineering, while also providing flexibility so that students can create a track tailored to their particular academic and career interests in a traditional or emerging discipline.

Engineering and Technology Entrepreneurship

Minor

*Department of Electrical and
Computer Engineering*
www.ece.stonybrook.edu

The purpose of the Engineering and Technology Entrepreneurship minor is to expose engineering students to entrepreneurial skills; and to expose non-engineering students to various technology entrepreneurship skills.

Environmental Engineering

Minor

*Department of Materials Science
& Engineering*
www.matscieng.sunysb.edu

Environmental engineering is the application of science and engineering principles to improving the environment (air, water, and/or land resources), and investigating the possibilities for remediation of polluted sites. Environmental engineering also involves design and application of technology, including development of new materials, in support of the principles of sustainability and green manufacturing.

This minor emphasizes the chemical mechanisms at work behind environmental

processes that govern production and transport of pollutants, bioavailability and toxicity, changing ecological and geochemical factors, and design of remediation and pollution prevention methodologies. It also provides coursework on materials and technology development for sustainable development and manufacturing.

Information Systems

Major (BS), BS/MBA, Minor, MS
Department of Computer Science
www.cs.stonybrook.edu

The Information Systems major prepares its graduates to design and build computerized data processing and decision support systems. Information Systems students learn how to build the systems that manage the information required in industries including advertising, retail, finance, insurance, manufacturing, biotechnology, pharmaceutical, medical imaging, air traffic control, satellite communications, and national defense. Career opportunities include top level design and supervision of a large variety of software systems, including online internet transactions, security, database management, network design, company internet portals, simulation tools and video games.

The program emphasizes the design and implementation aspects of large-scale information systems as well as managerial and organizational issues, and it balances development of system engineering skills with learning to deliver reliable systems on time and within budget.

Throughout the program, students are exposed to diverse application areas ranging from traditional business, finance, and accounting through telecommunications, networks, multimedia, and database management, to computer aided design and industrial production management systems. Students may design their own specialization, or complete one of the following specializations: Business and Economics; Technological Systems Management; Systems and Network Administration, and Digital Media.

Manufacturing Engineering Minor

Department of Materials Science
& Engineering
www.matscieng.sunysb.edu

The minor in Manufacturing Engineering is suitable for students who seek to obtain a more thorough understanding of modern manufacturing materials and processes. The rapidly changing nature of technology in manufacturing creates a need for graduates with a background in such areas as modern materials processing, design, additive manufacturing, rapid prototyping and 3D printing, “green” manufacturing processes, thermodynamics, statistics, and analysis.

Materials Science

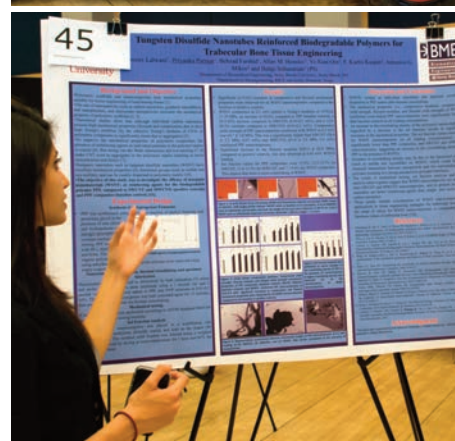
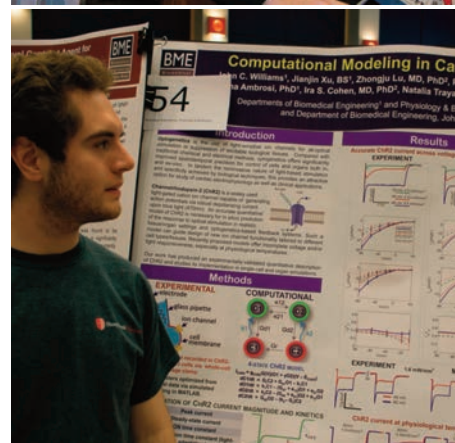
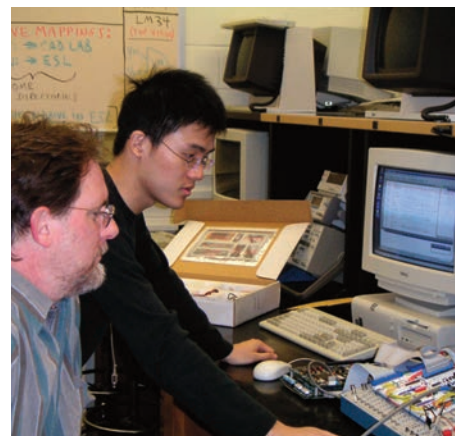
Minor
Department of Materials Science
& Engineering
www.matscieng.sunysb.edu

The development of new materials and research into the engineering applications of materials are critical to a wide variety of industries including aerospace, automotive, energy, electronics, environmental, medical instrumentation, advanced computing, and defense-related companies. The sequence of courses included in the minor in Materials Science provides a firm background for students seeking employment in materials-related industries or those who will pursue graduate study in related fields.

Mechanical Engineering

Major (BE), BE/MS, Minor, MS, PhD
Department of Mechanical Engineering
me.eng.stonybrook.edu

Mechanical engineering is one of the core disciplines of engineering and it encompasses a large number of subdisciplines in both traditional and leading edge technologies such as: energy conversion; power generation; design, and manufacturing. Mechanical engineers work in: energy; design; transportation; power generation; manufacturing; aerospace; computer, and household product industries.



Emerging technologies in biotechnology, materials science and nanotechnology will create new job opportunities for mechanical engineers. While many of our graduates are immediately employed in industry, a significant percentage pursues graduate study. Most of the students entering graduate schools continue with mechanical engineering studies. However, some go to law, business, and medical schools.

The curriculum provides students with a core education in mathematics and the physical sciences, along with courses covering thermal processes and fluid mechanics, mechanical design, solid mechanics, and the dynamic behavior and control of mechanical systems. Students also take courses that introduce them to the use of advanced computational methods for engineering design and analysis, and data processing and analysis. A series of laboratory courses introduces them to sensors and electronics, modern instrumentation and experimental techniques used in engineering for tasks ranging from product design, evaluation, and testing to research.

The Mechanical Engineering Department supports student-led groups that build and test an interactive robot, a fully functioning off-road “Baja” vehicle, and a solar powered racing boat. Stony Brook’s Robot Design, Solar Racing, and Motorsports teams compete in national and international competitions.

Nanotechnology Studies

Minor

*Department of Materials Science
& Engineering*
www.matscieng.sunysb.edu

The minor in Nanotechnology Studies is an interdisciplinary, research-intensive program that provides a broad background in the science, design, manufacture, and societal, health, and environmental impacts of nanomaterials and nanoscale structures and their applications in engineering and health related areas.

A minimum of two semesters of research in the students’ own major areas, as well as choice of technical electives, provide knowledge and skills for students

planning to seek employment or graduate studies in fields related to engineering, business, policy, or the broader impact of nanotechnology.

Technological Systems Management

Major (BS), BS/MS, Minor, MS

Department of Technology and Society
www.stonybrook.edu/est

This program integrates a foundation in the natural sciences, engineering, applied sciences, or environmental studies with applications in technology systems, assessment, and management. The Department also offers a minor in Technological Systems Management.

The major prepares students for careers in government, industry, or education in positions such as manager of computer network systems, manager of information systems, quality control specialist, systems or environmental analyst, technical sales representative, or technology trainer/educator. Students are also prepared for advanced study in areas such as business, law, education, policy analysis, and industrial or environmental management.

Students develop understanding of the characteristics, capabilities, and limitations of current and emerging technologies. The Department applies engineering concepts that underlie technological change and that form the bridge from engineering to other disciplines.

Future Career Outlooks

Specific predictions by the U.S. Department of Labor’s Bureau of Labor Statistics:
bls.gov/ooh

Jobs for civil engineers Employment of civil engineers is projected to grow 20 percent from 2012 to 2022, faster than the average for all occupations. As infrastructure continues to age, civil engineers will be needed to manage projects to rebuild bridges, repair roads, and upgrade levees and dams. Civil engineers play a key part in all of this work. The work of civil engineers will be needed for renewable energy projects. Civil engineers prepare the permit documents for these types of projects, verifying that the project will comply with federal, state, and local requirements. With regard to solar energy, these engineers conduct structural analyses for large-scale photovoltaic projects. They also evaluate the ability of solar array support structures and buildings to tolerate stresses from wind, seismic activity, and other sources. For large-scale wind projects, civil engineers often prepare road beds to handle large trucks that haul in the turbines. In addition, they prepare the sites on shore or offshore to make sure that the foundations for the turbines will safely keep the turbines upright in expected environmental conditions.

Jobs for actuaries Employment of actuaries is projected to grow 26 percent from 2012 to 2022, much faster than the average for all occupations. However, because it is a small occupation, the fast growth will result in only about 6,300 new jobs over the 10-year period. Actuaries will be needed to develop, price, and evaluate a variety of insurance products and calculate the costs of new risks. Actuaries should expect strong competition for jobs. Actuaries make up a small occupation, and the relatively high pay and comfortable working conditions make being an actuary a desirable career. Students who have passed at least two actuarial exams and have had an internship while in college should have the best job prospects for entry-level positions.

Jobs for statisticians Employment of statisticians is projected to grow 27 percent from 2012 to 2022, much faster than the average for all occupations. Growth is expected to result from more widespread use of statistical analysis to make informed business, healthcare, and policy decisions. A large amount of data is generated from Internet searching and the use of social media, smartphones, and other mobile devices. Businesses will increasingly need statisticians to organize, analyze, and sort through the data for commercial reasons. Analyses will help companies improve their business processes, design and develop new products, and advertise products to potential customers.

Future Career Outlooks

Biomedical engineers Employment of biomedical engineers is projected to grow 27 percent from 2012 to 2022, much faster than the average for all occupations. However, because it is a small occupation, the fast growth will result in only about 5,200 new jobs over the 10-year period. Biomedical engineers will likely see more demand for their services because of the breadth of activities they engage in, made possible by the diverse nature of their training.

Computer hardware engineers Employment of computer hardware engineers is projected to grow 7 percent from 2012 to 2022, slower than the average for all occupations. A limited number of engineers will be needed to meet the demand for new computer hardware because more innovation takes place with software than with hardware. Although declining employment in the manufacturing industries that employ many of these workers will negatively affect the growth of this occupation, computer hardware engineers should be less affected than production occupations because firms are less likely to outsource their type of work.

Electrical engineers Employment of electrical and electronics engineers is projected to grow 4 percent from 2012 to 2022, slower than the average for all occupations. Job growth is expected because of electrical and electronics engineers' versatility in developing and applying emerging technologies. Job growth for electrical and electronics engineers will largely occur in engineering services firms, because more companies are expected to cut costs by contracting engineering services rather than directly employing engineers. These engineers will also experience job growth in computer systems design, as these industries continue to implement more powerful portable computing devices.

Mechanical engineers Employment of mechanical engineers is projected to grow 5 percent from 2012 to 2022, slower than the average for all occupations. Job prospects may be best for those who stay informed regarding the most recent advances in technology. Mechanical engineers can work in many industries and on many types of projects. As a result, their growth rate will differ by the industries that employ them.

Mechanical engineers should experience faster than average growth in architectural, engineering, and related services as companies continue to contract work from these firms. Mechanical engineers will also remain involved in various manufacturing industries—specifically, transportation equipment and machinery manufacturing. They will be needed to design the next generation of vehicles and vehicle systems, such

as hybrid-electric cars and clean diesel automobiles. Machinery will continue to be in demand as machines replace more expensive human labor in various industries.

Network and computer systems administrators

Employment of network and computer systems administrators is projected to grow 12 percent from 2012 to 2022, about as fast as the average for all occupations. Demand for information technology workers is high and should continue to grow as firms invest in newer, faster technology and mobile networks. However, an increase in cloud computing could raise the productivity of network administrators, slowing their growth across many industries. Growth will be highest at industries that provide cloud-computing technology. Employment of network administrators in the computer systems design and related services industry is projected to grow 35 percent from 2012 to 2022.

Growth is also expected in healthcare industries as their use of information technology increases. More administrators will be required to manage the growing systems and networks found at hospitals and other healthcare institutions.

Employment of software developers Employment of software developers is projected to grow 22 percent from 2012 to 2022, much faster than the average for all occupations. Employment of applications developers is projected to grow 23 percent, and employment of systems developers is projected to grow 20 percent.

The main reason for the rapid growth is a large increase in the demand for computer software. Mobile technology requires new applications. The healthcare industry is greatly increasing its use of computer systems and applications. Also, concerns over threats to computer security could result in more investment in security software to protect computer networks and electronic infrastructure.

Systems developers are likely to see new opportunities because of an increase in the number of products that use software. For example, computer systems are built into consumer electronics, such as cell phones, and into other products that are becoming computerized, such as appliances. In addition, an increase in software offered over the Internet should lower costs and allow more customization for businesses, also increasing demand for software developers.

Employment of information security analysts, web developers, and computer network architects is projected to grow 37 percent from 2012 to 2022, much faster than the average for all occupations.

Demand for information security analysts is expected to be very high. Cyberattacks have grown in frequency and sophistication over the last few years, and many organizations are behind in their ability to detect these attacks. Analysts will be needed to come up with innovative solutions to prevent hackers from stealing critical information or creating havoc on computer networks.

Computer systems analysts Employment of computer systems analysts is projected to grow 25 percent from 2012 to 2022, much faster than the average for all occupations.

As organizations across the economy increase their reliance on information technology (IT), analysts will be hired to design and install new computer systems. Growth in cloud-computing, wireless, and mobile networks will create a need for new systems that work well with these networks.

Environmental engineers Employment of environmental engineers is projected to grow 15 percent from 2012 to 2022, faster than the average for all occupations.

State and local governments' concerns about water are leading to efforts to increase the efficiency of water use. This focus differs from that of wastewater treatment, for which this occupation is traditionally known.

The requirement by the federal government to clean up contaminated sites is expected to help sustain demand for these engineers' services, particularly those who work for the government sector. In addition, wastewater treatment is becoming a larger concern in areas of the country where new methods of drilling for shale gas require the use and disposal of massive volumes of water. Environmental engineers will continue to be needed to help utilities and water treatment plants comply with any new federal or state environmental regulations.

Computer and information systems managers

Employment of computer and information systems managers is projected to grow 15 percent from 2012 to 2022, faster than the average for all occupations.

Demand for computer and information systems managers will increase as firms continue to expand their use of wireless and mobile networks. A rapid increase in demand for computer software will also increase the need for employees at all levels of management.