NUCLEAR ENGINEERING, B.S.

The Department of Engineering Physics offers the B.S. degree in nuclear engineering and M.S. and Ph.D. degrees in nuclear engineering and engineering physics.

Nuclear engineering is defined as the application of nuclear and radiation processes in technology. An important application is the generation of electricity using nuclear reactors. Another important application is in medicine, where radiation and radioisotopes are used to diagnose and treat illness. Nuclear engineering offers students an important opportunity to help meet the energy needs of our society and to contribute to the improvement of health through medical applications. Further, because the nuclear engineering curriculum is very rich in engineering physics, graduates are prepared to work in a number of technical activities outside the nuclear engineering field.

Nuclear energy, both from fission and fusion, offers a promising approach to meeting the nation's energy needs—an approach that may preserve jobs, raise the standard of living of Americans, and alleviate the depletion of natural resources including natural gas, petroleum, and coal. Even more important, nuclear energy offers the only practical, environmentally benign approach to generating electricity on a large scale because it releases no harmful SO2, NOX, CO2, or particulate matter into the atmosphere. Nuclear energy has played, and continues to play, an important role in space exploration. Nuclear engineering has enabled the use of isotopic power supplies in deep space probes like the Cassini mission, and may eventually be used to design fission or fusion-based systems for more demanding missions

Since the discovery of fission many years ago, electricity is being produced commercially in a several hundred billion-dollar industry. Applications of radioactive tracers have been made in medicine, science, and industry. Radiation from particle accelerators and materials made radioactive in nuclear reactors are used worldwide to treat cancer and other diseases, to provide power for satellite instrumentation, to preserve food, to sterilize medical supplies, to search for faults in welds and piping, and to polymerize chemicals. Low energy plasmas are used in the manufacture of microelectronics components and to improve the surface characteristics of materials. High energy plasmas offer the possibility of a new energy source using thermonuclear fusion.

Because the breadth and rate of change in this field requires that the nuclear engineer have a broad educational background, the curriculum consists of physics, math, materials science, electronics, thermodynamics, heat transfer, computers, courses in the humanities and social science areas, and numerous elective courses. Courses of a specific nuclear engineering content come primarily in the third and fourth years.

The curriculum prepares students for careers in the nuclear industry and government—with electric utility companies, in regulatory positions with the federal or state governments, or for major contractors on the design and testing of improved reactors for central station power generation or for propulsion of naval vessels.

The curriculum also prepares the graduate for work in many areas where a broad technical background is more important than specialization in a specific field. Thus, the graduate is also prepared to work in any area where a broad engineering background is helpful, such as management, technical sales, or law. The curriculum gives students excellent preparation for graduate study in the fission and fusion areas, medical and health physics, applied superconductivity, particle accelerator technology, and other areas of engineering science in addition to study in areas such as materials science, physics, mathematics, and medicine.

OBJECTIVES OF THE NUCLEAR ENGINEERING PROGRAM

- educate students in the fundamental subjects necessary for a career in nuclear engineering, and prepare students for advanced education in it and related fields;
- educate students in the basics of instrumentation, design of laboratory techniques, measurement, and data acquisition, interpretation and analysis;
- educate students in the methodology of design;
- provide and facilitate teamwork and multidisciplinary experiences throughout the curriculum;
- foster the development of effective oral and written communication skills;
- expose students to environmental, ethical and contemporary issues.

ENGINEERING MECHANICS AND NUCLEAR ENGINEERING PROGRAM EDUCATIONAL OBJECTIVES

The faculty recognize that our graduates will choose to use the knowledge and skills they have acquired during their undergraduate years to pursue a wide variety of career and life goals and we encourage this diversity of paths. Regarding the Engineering Mechanics program, we initially expect graduates will begin their careers in fields that utilize their knowledge, education and training in solid mechanics, fluid mechanics and dynamics/vibration in a variety of jobs in mechanical, aerospace, manufacturing and other engineering fields. Similarly, regarding the Nuclear Engineering program, we initially expect graduates will begin their careers in fields that utilize their knowledge, education and training in the interaction of radiation with matter as it applies to power generation, health and medical physics, security and safeguards and other engineering fields.

Whatever path our graduates choose to pursue, our educational objectives for the nuclear engineering and engineering mechanics programs are to allow them to:

1. Exhibit strong performance and continuous development in problem-solving, leadership, teamwork, and communication, initially applied to nuclear engineering or engineering mechanics, and demonstrating an unwavering commitment to excellence.
2. Demonstrate continuing commitment to, and interest in, his or her training and education, as well as those of others.
3. Transition seamlessly into a professional environment and make continuing, well-informed career choices.
4. Contribute to their communities.