

# Nuclear Engineering

Course Bulletin (PDF)

## Department of Mechanical Engineering

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<http://www.mecheng.osu.edu/nuclear/>

## Degrees offered

- Undergraduate Minor
- Master of Science
- Doctor of Philosophy

The nuclear engineer is concerned with the application of nuclear science and technology for the benefit of humankind. The safe, economic development of nuclear energy is a major area of activity for the nuclear engineer. The nuclear engineer is also concerned with the uses of radiation in medical diagnostics and therapy, preservation of food by irradiation, and the uses of radiation in industry for improving products and making measurements. The nuclear engineer is prepared to design a nuclear power reactor, determine how to operate a nuclear power plant most efficiently, and assist in the evaluation of environmental factors in existing nuclear power plants. With the rapidly expanding use of radiation in fields such as medical diagnostics and therapy and food irradiation, there is continuous demand for specialists in radiation protection and health physics. The safe, long-term storage of nuclear waste is also a challenging technical problem requiring engineers with knowledge of basic nuclear engineering.

## Undergraduate options

Undergraduate Minor in Nuclear Engineering: Any engineering student may apply for an undergraduate minor in nuclear engineering. Students interested in the minor simply complete the Minor Program Form, which is available in the College Office (Room 122 Hitchcock Hall or <http://www.eng.ohio-state.edu/departments/index.php>), and obtain the required signatures.

The undergraduate minor in Nuclear Engineering requires 4 core courses and 3 additional courses selected from a list of options. Up to 10 hours of courses in the minor may be used as technical electives in some majors. The courses offered in the Nuclear Engineering minor are:

## **Core**

- NE 505 Introduction to Nuclear Science and Engineering (3 credit hours) - AU and SP
- NE 606 Radiological Safety (3 credit hours) - AU
- NE 701 Introduction to Nuclear Power Engineering (3 credit hours) - WI
- NE 736 Nuclear Power Plants (3 credit hours) - WI

## **Options (select 3)**

- NE 716 Probabilistic Reliability Safety Analysis (3 credit hours) - SP
- NE 720 Reactor Dynamics and Control (3 credit hours) - AU
- NE 735 Power Plant Operations I (3 credit hours) - WI
- NE 737 Heat Transfer Applications in Nuclear Reactor Systems (3 credit hours) - SP
- NE 742 Nuclear Radiations and Their Measurement (3 credit hours) - WI
- NE 743 Nuclear Radiations and Their Shielding (3 credit hours) - AU
- NE 745 Power Plant Operations II (3 credit hours) - SP
- NE 771 Radioactive Waste Management (3 credit hours) - AU
- NE 776 Nuclear Fuel Cycles (3 credit hours) - AU

Undergraduate work in nuclear engineering and mechanical engineering: The nuclear engineering concentration in mechanical engineering is recommended for students wishing to become nuclear engineers. In addition to the conventional engineering studies, such as engineering science, mathematics, thermodynamics, heat transfer, fluid flow, materials, mechanical design, and methods and instruments for measurement and control, nuclear engineering courses provide the fundamentals of atomic and nuclear physics and the physical principles of nuclear reactors and systems. The student learns about radiation, how it originates and interacts with materials, and how it can be measured and utilized safely. The student further learns how nuclear reactors are designed, built, and operated to produce electrical power and how energy resources, environmental concerns, and the economics of producing electricity enter the picture. The program in nuclear engineering and mechanical engineering consists of the degree requirements in mechanical engineering as described in this bulletin plus nuclear engineering courses taken as technical electives. An example of a typical program follows:

### **Second or third year**

- Nuclr En 505 (Introduction to Nuclear Science and Engineering) 3

### **Third year**

- Nuclr En 606 (Radiological Safety) 3
- Nuclr En 736 (Nuclear Power Plant) 3

### **Fourth year**

- Nuclr En 701 (Introduction to Nuclear Power Engineering) 3
- Nuclr En 737 (Heat Transfer Applications in Nuclear Reactor Systems) or

## **Total 16**

Both Nuclear Engineering 716 and 737 are strongly recommended. Nuclear Engineering 720, 735, 742, 743, 745, 771, and 776, and Materials Science and Engineering 681 may also be chosen as electives. In addition to these courses, students following the nuclear engineering concentration obtain further nuclear training through application of engineering principles to nuclear systems as treated in the basic mechanical engineering curriculum and through specific nuclear engineering projects. The latter projects occur in the senior year design courses where the student investigates nuclear design, instrumentation, and laboratory projects of interest in nuclear engineering.

Nuclear engineering and engineering physics: The combined program in nuclear engineering and engineering physics is designed to prepare students for career opportunities in nuclear medicine, reactor physics, nuclear instrumentation, or fusion. This program serves also as preparation for graduate work in these areas. The combined program in nuclear engineering and engineering physics consists of the degree requirements of engineering physics as described in this bulletin, the nuclear engineering undergraduate core curriculum (NE 505, NE 606, NE 701, and NE 736), and the following courses:

## **Second or third year**

- Mech Eng 500 4 hours

## **Fourth year**

Six hours of technical electives, to be selected from Welding Engineering 631, Materials Science and Engineering 681, and Nuclear Engineering 701, 704, 716, 720, 735, 742, 745, 771, and 776 are recommended.

The diverse needs of a changing nuclear industry afford career opportunities for engineers in many fields such as materials, electronics, chemical processing, nondestructive testing, structural design, mining, and others. Students interested in combining nuclear engineering with undergraduate programs in other engineering fields should contact the nuclear engineering program chair and appropriate departments for further information.

## **Combined BS/MS graduate degree program**

The combined BS/MS degree program in nuclear engineering is an opportunity available for qualified undergraduates in all engineering disciplines and engineering physics. Excellent students are able to initiate the master's program (research) in nuclear engineering during the senior year, with the possibility of completing their MS within three quarters following completion of the bachelor's degree requirements. Graduate research associate (GRA) appointments are available following admission to the Graduate School. A GRA appointment includes a monthly stipend plus a tuition waiver.

## **Admission requirements**

For admission to the combined BS/MS program, applicants must provide the same credentials required by the Graduate School of other MS degree applicants and meet all of the usual requirements of the MS program as specified by the Graduate School and the nuclear engineering program. Applicants also must satisfy the following special criteria:

- senior-level standing; and
- minimum 3.50 cumulative point-hour ratio in all previous undergraduate work.

Suggested courses available for dual BS/MS credit: (15 hours maximum)

- Nuclr En 606, 704, 716, 720, 735, 736, 742, 743, 771