

# NUCLEAR ENGINEERING

## COURSE 22

### CONTACT

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### DESCRIPTION

Nuclear engineering majors study radioactive materials and nuclear science and learn how to use them in areas such as power, nuclear medicine, and industry. Students acquire a strong interdisciplinary foundation in science-based engineering - classes cover the ground of such disparate fields as physics, materials science, and political science. As a part of this interdisciplinary education, students also engage with the larger societal impacts that nuclear engineering has produced. Students will develop the skills and knowledge for a broad range of careers, from practical engineering work in the energy industries to graduate research and education, entrepreneurship, law, medicine, and business.

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22 Nuclear Engineering

### INTRODUCTORY CLASSES

#### 22.01 Introduction to Nuclear Engineering and Ionizing Radiation

Provides an introduction to nuclear science and its engineering applications. Describes basic nuclear models, radioactivity, nuclear reactions and kinematics. Covers the interaction of ionizing radiation with matter, with an emphasis on radiation detection, radiation shielding, and radiation effects on human health. Presents energy systems based on fission and fusion nuclear reactions, as well as industrial and medical applications of nuclear science.

#### 22.033 Nuclear Systems Design Project

Group design project involving integration of nuclear physics, particle transport, control, heat transfer, safety, instrumentation, materials, environmental impact, and economic optimization. Provides opportunity to synthesize knowledge acquired in nuclear and non-nuclear subjects and apply this knowledge to practical problems of current interest in nuclear applications design.

#### 22.04 Social Problems of Nuclear Energy

Surveys the major social challenges for nuclear energy. Topics include the ability of nuclear power to help mitigate climate change; challenges associated with ensuring nuclear safety; the effects of nuclear accidents; the management of nuclear waste; the linkages between nuclear power and nuclear weapons, the consequences of nuclear war; and political challenges to the safe and economic regulation of the nuclear industry.

### COURSE 22-FRIENDLY UROP AREAS

MIT Nuclear Reactor Laboratory

Center for Advanced Nuclear Energy Systems

Mesoscale Nuclear Materials Lab (Short Lab)  
Plasma Science and Fusion Center  
H. H. Uhlig Corrosion Laboratory

### **GET INVOLVED WITH COURSE 22 (INCLUDING AT MIT!)**

American Nuclear Society

### **SKILLS**

Analytical and quantitative reasoning  
Knowledge of relevant laws and regulations  
Strong interpersonal and communication skills  
Interpret and write technical documentation

### **POSSIBLE FUTURE POSITIONS**

- **Nuclear engineer:** Nuclear engineers research and develop the processes, instruments, and systems used to derive benefits from nuclear energy and radiation. Many find industrial and medical uses for radioactive materials—for example, in equipment used in medical diagnosis and treatment.
- **Energy consultant:** Design and evaluate projects and programs to reduce energy costs or improve energy efficiency during the design, building, or remodeling stages of construction.

### **CAREER INDUSTRY EXAMPLES**

Engineering services	Manufacturing
Research	Government
Electric power generation	Health and safety

### **SAMPLE EMPLOYERS**

PowerAdvocate	U.S. Navy	Naval Nuclear Laboratory
IDA	Oklo	Bechtel Corporation
MITRE	NextEra Energy, Inc.	NPG Van