

# Nuclear Engineering & Radiological Sciences

## WHAT IS NUCLEAR ENGINEERING & RADIOLOGICAL SCIENCES?

Nuclear engineers research and develop the processes, instruments, and systems used to derive benefits from nuclear energy and radiation. They design, develop, monitor, and operate nuclear plants to generate power. They may work on the nuclear fuel cycle – the production, handling, and use of nuclear fuel and the safe disposal of waste produced by the generation of nuclear energy, or on the development of fusion energy. Some specialize in the development of nuclear power sources for spacecraft; others find industrial and medical uses for radioactive materials, as in equipment used to diagnose and treat medical problems.\*

### NEEDED SKILLS:

- Active listening
- Critical thinking & data analysis
- Quality control analysis (inspecting and evaluating products and processes for quality and accuracy)
- Decision-making
- Machine/computer skills
- Communication skills\*\*

### JOB TITLES

- Nuclear Design Engineer
- Radiation Engineer
- Nuclear Reactor Inspector
- Risk and Reliability Engineer
- Atomic Process Engineer
- Generation Engineer
- Nuclear Plant Technical Advisor
- Responsible System Engineer
- Radiological Defense Officer
- Radioactive Waste Management Engineer
- Nuclear Fuels Research Engineer
- Nuclear Steam System Supply Engineer
- Criticality Safety Officer
- Weapons Designer\*\*

### SALARIES

**\$102,950\***

The nationwide average salary for employees with a bachelor's degree in Nuclear Engineering & Radiological Sciences

**\$63,250**

UM graduates average starting salaries

*Courtesy of the Engineering Career Resource Center*

*\*Information from <http://www.bls.gov/ooh/>*

*\*\*Information from: [www.myplan.com](http://www.myplan.com)*

### INDUSTRIES AND OCCUPATIONS

- Scientific research and development
- Power generation, transmission & distribution
- Federal Government
- Healthcare industry
- Architectural engineering services
- Business consulting\*\*

### JOB OUTLOOK

Employment of nuclear engineers is expected to decline 4% from 2014 to 2024. Employment trends in power generation may be favorable because of the likely need to upgrade safety systems at power plants. These engineers also will find work in creating designs for power plants to be built abroad and in the growing field of nuclear medicine.\*

### MORE INFORMATION

- [www.myplan.com](http://www.myplan.com)
- [stats.bls.gov/ooh](http://stats.bls.gov/ooh)
- [www.ans.org](http://www.ans.org) (American Nuclear Society)
- <http://www.ners.engin.umich.edu/> (UM program website)
- Engineering Career Resource Center, 230 Chrysler
- See an NERS advisor. Contact Trisha Fountain in the NERS Department at 936-3130; or visit 1919 Cooley Building.

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## WHICH NERS CLASSES SHOULD YOU START WITH?

NERS students generally begin with MATSCIE 220 or MATSCIE 250, MECHENG 235, and NERS 250. Note that NERS 250 is only offered in the Winter Term, and it must be preceded by or taken in conjunction with MATH 216 and PHYS 240. Read more about the NERS Department at: [www.engin.umich.edu/ners](http://www.engin.umich.edu/ners)

## COURSE DESCRIPTIONS

### **MECHENG 235 – 3 credits**

#### **Thermodynamics I**

*Prerequisites: Chem 130/125 or Chem 210/211 and Math 116.*  
Introduction to engineering thermodynamics. First law, second law, system and control volume analyses; properties and behavior of pure substances; application to thermodynamic systems operating in steady state and transient processes. Heat transfer mechanisms. Typical power producing cycles and refrigerators. Ideal gas mixtures and moist air applications.

### **▲ MATSCIE 250 – 4 credits**

#### **Principles of Engineering Materials**

*Prerequisite: Chem 130 or Chem 210.*  
Introductory course to engineering materials. Properties (mechanical, thermal and electrical) of metals, polymers, ceramics and electronic materials. Correlation of these properties with their internal structures (atomic, molecular, crystalline, micro- and macro-), service conditions (mechanical, thermal, chemical, electrical, magnetic, and radiation), and processing.

### **▲ MATSCIE 220 – 4 credits**

#### **Introduction to Materials and Manufacturing**

*Prerequisite: Chem 130 or Chem 210.*  
Introduction to materials engineering and materials processing in manufacturing. The engineering properties of metals, polymers, semiconductors, ceramics, and composites are correlated with the internal structure of the materials and the service conditions.

### **NERS 250 – 4 credits**

#### **Fundamentals of Nuclear Engineering and Radiological Sciences ONLY OFFERED WINTER TERM**

*Prerequisites: Preceded or accompanied by Math 216 and Physics 240.*  
Technological, industrial and medical applications of radiation, radioactive materials and fundamental particles. Special relativity, basic nuclear physics, interactions or radiation with matter. Fission reactors and the fuel cycle.

**▲ Note that students may elect to take either  
MATSCIE 220 or MATSCIE 250**