NUCLEAR, PLASMA, & RADIOLOGICAL ENGINEERING, BS

for the degree of Bachelor of Science in Nuclear, Plasma, & Radiological Engineering

Nuclear, plasma, and radiological engineering encompasses a broad and diverse but complimentary set of engineering disciplines with a wide variety of applications – in energy production, plasma processing of materials, fusion development, biomedical research and healthcare, and nuclear safeguards and radiation detection. The first two years of the NPRE curriculum provides a strong foundation in sciences (physics, mathematics, and chemistry), in engineering (mechanics and thermodynamics), in computer use, and in nuclear energy systems. Most of the technical core and concentration coursework takes place in the third and fourth years of the curriculum. Students choose from among three concentrations: power, safety and the environment; plasma and fusion science and engineering; and radiological, medical and instrumentation applications. Each concentration requires students acquire a depth of understanding of the area but with flexibility to develop advanced technical expertise depending upon the student's specific educational and professional interests. Students demonstrate proficiency in the engineering design process in a senior design capstone course.

Current Program Educational Objectives

Students pursuing this major must select one of three concentrations:

- Plasma & Fusion Science & Engineering (http://catalog.illinois.edu/undergraduate/engineering/nuclear-plasma-radiological-engineering-bs/plasma-fusion-science-engineering/)
- Power, Safety & Environment (http://catalog.illinois.edu/undergraduate/engineering/nuclear-plasma-radiological-engineering-bs/power-safety-environment/)
- Radiological, Medical & Instrumentation Applications (http://catalog.illinois.edu/undergraduate/engineering/nuclear-plasma-radiological-engineering-bs/radiological-engineering-radiological-medical-instrumentation-applications/)

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Graduation Requirements

Minimum hours required for graduation: 128 hours.

Minimum Overall GPA: 2.0

Minimum Technical GPA (https://go.grainger.illinois.edu/TechnicalGPA/): 2.0

TGPA is required for NPRE 200 and NPRE 247. See Technical GPA (https://go.grainger.illinois.edu/TechnicalGPA/) to clarify requirements.

University Requirements

Minimum of 40 hours of upper-division coursework, generally at the 300- or 400-level. These hours can be drawn from all elements of the degree. Students should consult their academic advisor for additional guidance in fulfilling this requirement.

The university and residency requirements can be found in the Student Code (https://studentcode.illinois.edu/article3/part8/3-801/) (§ 3-801) and in the Academic Catalog (http://catalog.illinois.edu/general-information/degree-general-education-requirements/).

General Education Requirements

Follows the campus General Education (Gen Ed) requirements (https://courses.illinois.edu/gened/DEFAULT/DEFAULT/). Some Gen Ed requirements may be met by courses required and/or electives in the program.

Code	Title	Hours
Composition I		4-6
Advanced Composition		3
Humanities & the Arts (6 hours)		6
Natural Sciences & Technology (6 hours)		6
	fulfilled by CHEM 102, PHYS 211, PHYS 212	
Social & Behavioral Sciences (6 hours)		6
	fulfilled by ECON 102 or ECON 103 and any other course approved as Social & Behavioral Sciences	
Cultural Studies: Non-Western Cultures (1 course)		3
Cultural Studies: US Minority Cultures (1 course)		3
Cultural Studies: Western/Comparative Cultures (1 course)		3
Quantitative Reasoning (2 courses, at least one course must be Quantitative Reasoning I)		6-10
	fulfilled by MATH 220 or MATH 221; and MATH 231, MATH 241, MATH 285, PHYS 211, PHYS 212; and CS 101 or CS 124	
Language Requirement (Completion of the third semester or equivalent of a language other than English is required)		0-15

Orientation and Professional Development

Code	Title	Hours
ENG 100	Grainger Engineering Orientation Seminar (External transfer students take ENG 300.)	1
NPRE 100	Orientation to NPRE	1
Total Hours		**2**

Introductory Economics Elective

Code	Title	Hours
ECON 102	Microeconomic Principles	3
or ECON 103	Macroeconomic Principles	
Total Hours		**3**

Foundational Mathematics and Science

Code	Title	Hours
CHEM 102	General Chemistry I	3
CHEM 103	General Chemistry Lab I	1

MATH 221	Calculus I (MATH 220 may be substituted. MATH 220 is appropriate for students with no background in calculus. 4 of 5 credit hours count towards degree.)	4
MATH 231	Calculus II	3
MATH 241	Calculus III	4
MATH 257	Linear Algebra with Computational Applications	3
MATH 285	Intro Differential Equations	3
PHYS 211	University Physics: Mechanics	4
PHYS 212	University Physics: Elec & Mag	4
Total Hours		**29**

Nuclear, Plasma, and Radiological Engineering Technical Core

Code	Title	Hours
CS 101	Intro Computing: Engrg & Sci (CS 124 may be taken instead of CS 101.)	3
ECE 205	Electrical and Electronic Circuits	3
ME 200	Thermodynamics	3
ME 310	Fundamentals of Fluid Dynamics	4
or TAM 335	Introductory Fluid Mechanics	
NPRE 200	Mathematics for Nuclear, Plasma, and Radiological Engineering	2
NPRE 247	Modeling Nuclear Energy System	3
NPRE 321	Introduction to Plasmas and Applications	3
NPRE 330	Materials in Nuclear Engineering	3
NPRE 349	Introduction to NPRE Heat Transfer	2
NPRE 441	Radiation Protection	4
NPRE 445	Interaction of Radiation with Matter	4
NPRE 449	Nuclear Systems Engineering and Design	3
NPRE 451	NPRE Laboratory	3
NPRE 455	Neutron Diffusion & Transport	4
NPRE 458	Design in NPRE	4
TAM 210	Introduction to Statics (TAM 211 may be taken instead of TAM 210. The extra hour may be applied towards the Professional Concentration Area electives.)	2
TAM 212	Introductory Dynamics (PHYS 325 may be taken instead of TAM 212 for students pursuing the PHYS minor.)	3
Total Hours		**53**

Professional Concentration Area

Code	Title	Hours
Choose one from list below:		
Plasma & Fusion Science & Engineering (http://catalog.illinois.edu/undergraduate/engineering/nuclear-plasma-radiological-engineering-bs/plasma-fusion-science-engineering/)		17
Power, Safety & Environment (http://catalog.illinois.edu/undergraduate/engineering/nuclear-plasma-radiological-engineering-bs/power-safety-environment/)		17
Radiological, Medical & Instrumentation Applications (http://catalog.illinois.edu/undergraduate/engineering/nuclear-plasma-radiological-engineering-bs/radiological-engineering-radiological-medical-instrumentation-applications/)		17

Free Electives

Code	Title	Hours
Additional course work, subject to the Grainger College of Engineering restrictions to Free Electives, so that there are at least 128 credit hours earned toward the degree. (https://go.grainger.illinois.edu/FreeElectives/)		11
Total Hours of Curriculum to Graduate		**128**

for the degree of Bachelor of Science in Nuclear, Plasma, & Radiological Engineering

Sample Sequence

This sample sequence is intended to be used only as a guide for degree completion. All students should work individually with their academic advisors to decide the actual course selection and sequence that works best for them based on their academic preparation and goals. Enrichment programming such as study abroad, minors, internships, and so on may impact the structure of this four-year plan. Course availability is not guaranteed during the semester indicated in the sample sequence.

Students must fulfill their Language Other Than English requirement by successfully completing a third level of a language other than English. See the corresponding section on the Degree and General Education Requirements *(*http://catalog.illinois.edu/general-information/degree-general-education-requirements/*).*

First Year

First Semester	Hours	Second Semester	Hours
NPRE 100	1	CS 101 (CS 124 may be substituted)	3
MATH 221 (Math 220 may be substituted)	4	MATH 231	3
ENG 100	1	PHYS 211	4
CHEM 102	3	Language Other than English (3rd level) or Composition I	4
CHEM 103	1	ECON 102 or 103 (counts as General Education Course)	3
Composition I or Language Other than English (3rd level)	4		

General Education course (choose a Humanities or Social/Behavorial Science course with Cultural Studies designation)	3		
	17		**17**

Second Year

First Semester	Hours	Second Semester	Hours
NPRE 200	2	NPRE 247	3
MATH 241	4	MATH 285	3
PHYS 212	4	ME 200	3
TAM 210 (TAM 211 may be substituted)	2	TAM 212 (PHYS 325 may be substituted)	3
General Education course (choose a Humanities or Social/Behavorial Science course with Cultural Studies designation)	3	Free elective course	3
Free elective course	2		
	17		**15**

Third Year

First Semester	Hours	Second Semester	Hours
NPRE 321 or 330 (Order of semester taken will depend upon concentration course)	3	NPRE 349	2
MATH 257	3	NPRE 451	3
NPRE 445	4	NPRE 455	4
TAM 335 (ME 310 may be substituted)	4	ECE 205	3
General Education course (choose a Humanities or Social/Behavorial Science course with Cultural Studies designation)	3	Concentration Coursework	3
	17		**15**

Fourth Year

First Semester	Hours	Second Semester	Hours
NPRE 321 or 330 (Order of semester taken will depend upon concentration course)	3	NPRE 441	4
NPRE 449	3	NPRE 458	4
Concentration Coursework	3	Concentration Coursework	3
Concentration Coursework	3	Concentration Coursework	3
Concentration Coursework	2		
Free Elective course	2		
	16		**14**

Total Hours 128

for the degree of Bachelor of Science Major in Nuclear, Plasma, & Radiological Engineering

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Student learning outcomes are based on learning outcomes in line with the ABET accreditation process.

Nuclear, Plasma, & Radiological Engineering graduates will have:

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. An ability to communicate effectively with a range of audiences.
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

for the degree of Bachelor of Science in Nuclear, Plasma, & Radiological Engineering

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Nuclear, Plasma, & Radiological Website
Nuclear, Plasma, & Radiological Engineering Faculty (https://npre.illinois.edu/directory/faculty/)

The Grainger College of Engineering Admissions (https://grainger.illinois.edu/admissions/)
The Grainger College of Engineering