

# NUCLEAR, PLASMA & RADIOLOGICAL ENGINEERING, PHD

for the degree of Doctor of Philosophy in Nuclear, Plasma & Radiological Engineering

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**overview of admissions & requirements:** <https://npre.illinois.edu/admissions/graduate> (<https://npre.illinois.edu/admissions/graduate/>)

**overview of grad college admissions & requirements:** <https://grad.illinois.edu/admissions/apply> (<https://grad.illinois.edu/admissions/apply/>)

**department website:** <http://npre.illinois.edu> (<https://npre.illinois.edu/>)

**program website:** <https://npre.illinois.edu/academics/graduate> (<https://npre.illinois.edu/academics/graduate/>)

**department faculty:** <https://npre.illinois.edu/people/faculty> (<https://npre.illinois.edu/people/faculty/>)

**college website:** <https://grainger.illinois.edu/>

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Opportunity exists for specializing in computational science and engineering via the Computational Science & Engineering (<http://catalog.illinois.edu/graduate/engineering/concentration/computational-science-engineering/>) optional graduate concentration.

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The Department of Nuclear, Plasma and Radiological Engineering offers both a traditional doctoral program and a direct doctoral program. The traditional doctoral program requires candidates enter with an approved master's degree. The direct doctoral program allows highly qualified applicants with a baccalaureate degree to be admitted directly into the PhD program without an MS degree. The direct PHD program has the same coursework requirements as the MS plus PhD route, however students in the direct PhD do not write an MS thesis and do not receive an MS degree.

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## Admission Requirements

Application for admissions to the master's and doctoral degree programs is open to all graduates in engineering, mathematics, and the physical sciences with a grade point average of at least 3.00 (A = 4.00) for the last two years of undergraduate work and any graduate work completed.

Prerequisites for admission include a course in ordinary differential equations plus one other mathematics course beyond calculus; an intermediate course in atomic and nuclear physics or interaction of radiation with matter; a course in electrical circuit theory; a course in thermodynamics; a course in fluid mechanics or continuum mechanics; and a course introducing nuclear engineering. A student may be admitted before completion of these prerequisites, but he or she must allow additional time to make up for these deficiencies; courses taken to make up such deficiencies will not count toward the number of units required for the graduate degree. Transcripts and letters of recommendation are required. The Graduate Record Exam (GRE) (<http://www.ets.org/>) is required. Information such as undergraduate class rank is recommended.

For full consideration of fall admission with financial aid, application receipt deadline is January 1st. Students who wish to enter in the spring term should contact the Department before applying. For full consideration of spring admission with financial aid, application receipt deadline is October 15th.

All applicants whose native language is not English are required to submit TOEFL (<http://www.toefl.org/>) or International English Language Testing System (IELTS) (<http://www.ielts.org/>) scores as evidence of English proficiency. Minimum admission requirements (<https://grad.illinois.edu/admissions/instructions/04c/>) are set by the Graduate College.

## Financial Aid

Most graduate students receive some form of financial aid. Fellowships (<https://grad.illinois.edu/fellowships/about/>) are available to support the best applicants. Other students are supported on teaching or research assistantships (<https://grad.illinois.edu/assistantships/>). Starting in Fall 2020, Grainger Engineering PhD students in their first five years of enrollment who meet the minimum eligibility requirements (<https://grainger.illinois.edu/academics/graduate/phd-funding-guarantee/>) are guaranteed a funded appointment for fall and spring that includes a full tuition waiver, a partial fee waiver, and a stipend. Financial aid includes federally sponsored traineeships and fellowships and University and industry fellowships. The University is approved for several fellowships including those from the Department of Energy, Nuclear Regulatory Commission, the National Science Foundation, the Hertz Foundation and others.

All applicants, regardless of US citizenship, whose native language is not English and who wish to be considered for teaching assistantships must demonstrate spoken English language proficiency (<http://grad.illinois.edu/admissions/taengprof.htm>) by achieving a minimum score of 24 on the speaking subsection of the TOEFL iBT or 8 on the speaking subsection of the IELTS. For students who are unable to take the iBT or IELTS, a minimum score of 4CP is required on the EPI test ([http://cte.illinois.edu/testing/oral\\_eng/epi\\_overview.html](http://cte.illinois.edu/testing/oral_eng/epi_overview.html)), offered on campus. All new teaching assistants

are required to participate in the Graduate Academy for College Teaching (<https://citl.illinois.edu/citl-101/teaching-learning/grad-academy-for-college-teaching/>) conducted prior to the start of the semester.

## Department Research

Research activities in the Department of NPRE encompass a diverse range of investigation and challenge areas as described on the department's research area website (<https://npre.illinois.edu/research/areas/>), these include but are not limited to: nuclear science and engineering, radiation processes and transport, materials science, thermal sciences, systems engineering, energy conversion processes and systems, plasma sciences and processing, fusion energy, radiation-based medical imaging and therapy, dosimetry and radiation protection, radiation detection analysis, reliability and risk analysis, energy systems, and international security. Graduate students in the Department are active participants and contributors to these areas of education and research and typically pursue careers in one of these areas. Graduate students in the Department are also encouraged to take part in course work and research activities in other engineering and science departments to complement their professional development in the nuclear engineering field. Faculty in other related fields are available to supervise research for students through formal "affiliate faculty" appointments. For a detailed list of current research interests of the faculty, visit the department's Research web site (<https://npre.illinois.edu/research/>).

A wide range of major research resources are available for nuclear engineering research. These are described at the department's Research Facilities website (<https://npre.illinois.edu/research/facilities/>).

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## Other Graduate Programs in the Department of Nuclear, Plasma & Radiological Engineering

degrees:

Nuclear, Plasma, & Radiological Engineering, MS (<http://catalog.illinois.edu/graduate/engineering/nuclear-plasma-radiological-engineering-ms/>)

### optional concentrations for the PhD:

Computational Science & Engineering (<http://catalog.illinois.edu/graduate/engineering/concentration/computational-science-engineering/>) | Data Science & Engineering (<http://catalog.illinois.edu/graduate/engineering/concentration/data-science-engineering/>)

concentrations:

Energy Systems (<http://catalog.illinois.edu/graduate/engineering/engineering-meng/energy-systems/>)

### available for:

Engineering, MENG (<http://catalog.illinois.edu/graduate/engineering/engineering-meng/>)

Plasma Engineering (<http://catalog.illinois.edu/graduate/engineering/engineering-meng/plasma-engineering/>)

### available for:

Engineering, MENG (<http://catalog.illinois.edu/graduate/engineering/engineering-meng/>)

The Department of Nuclear, Plasma & Radiological Engineering (NPRE) offers programs leading to degrees of Master of Science and Doctor of Philosophy in Nuclear, Plasma & Radiological Engineering, as well as Master of Engineering in Engineering with a Concentration in Energy Systems or a Concentration in Plasma Engineering. The Master of Science and Doctor of Philosophy degree programs are centered around five theme areas:

- nuclear power
- plasma physics and fusion
- radiological science
- materials science
- reliability and risk

Advanced course work and active research programs are offered in all of these areas.

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The doctoral candidate must complete course work, pass a qualifying examination, a preliminary doctoral examination, write a doctoral thesis, and successfully defend the thesis at a final examination before a doctoral faculty committee. A doctoral student typically takes several courses in NPRE plus additional courses that support a specialized research area and provide background in mathematics and science. Under exceptional circumstances and by approved petition, doctoral research may be undertaken off campus.

*For additional details and requirements refer to the department's printed handbook and the Graduate College Handbook (<http://grad.illinois.edu/gradhandbook/>). Learn more on the Q (<http://npre.illinois.edu/academics/graduate-program/qualifying-examination/>) qualifying Exam (<http://npre.illinois.edu/academics/graduate-program/qualifying-examination/>).*

**Entering with an approved Master's Degree:**

Code	Title	Hours
NPRE 599	Thesis Research (min-max applied toward degree)	40
NPRE 501 & NPRE 521	Fundamentals of Nuclear Engrg and Interact of Radiation w/Matter (if not taken while completing the M.S. degree)	0-8
NPRE 596	Seminar in Nuclear Sci & Engrg (registration for 1 hour every semester while in residence; credit does not apply toward the degree.)	0
Elective Courses (subject to Other Requirements and Conditions below)		16
8 hours of 500-level courses (not including NPRE 501 and NPRE 521)		
4-8 hours of NPRE graduate level courses, not counting 402, 446, 501, 521, 596, or 599		
<b>Total Hours</b>		<b>64</b>

**Other Requirements and Conditions**

Requirement	Description
Other Requirements and Conditions may overlap	
Consult department for details of minimum hours required within the unit.	
Credit in NPRE 402 or NPRE 446 does not count toward the degree.	
A Master's degree or equivalent is required for admission to the Ph.D. program.	
Ph.D. exam and dissertation requirements:	
Qualifying exam:	
Preliminary exam	
Final exam or dissertation defense	
Dissertation deposit	
Minimum GPA:	3.0

**Entering with an approved Baccalaureate Degree:**

Code	Title	Hours
NPRE 599	Thesis Research (min-max applied toward degree)	40-48
NPRE 501 & NPRE 521	Fundamentals of Nuclear Engrg and Interact of Radiation w/Matter	8
NPRE 596	Seminar in Nuclear Sci & Engrg (registration for 1 hour every semester while in residence; credit does not apply toward the degree. )	0
Elective Courses (subject to Other Requirements and Conditions below)		40-48
16 hours of 500-level courses (not including NPRE 501 and NPRE 521)		
12-16 hours of NPRE graduate level courses, not counting 402, 446, 501, 521, 596, or 599		
<b>Total Hours</b>		<b>96</b>

**Other Requirements and Conditions**

Requirement	Description
Other Requirements and Conditions may overlap	
Consult department for details of minimum hours required within the unit.	
Credit in NPRE 402 or NPRE 446 does not count toward the degree.	
Students not completing an MS thesis may only count 40 credit hours of NPRE 599.	
Ph.D. exam and dissertation requirements:	
Qualifying exam:	
Preliminary exam	
Final exam or dissertation defense	
Dissertation deposit	
Minimum GPA:	3.0