NUCLEAR, PLASMA & RADIATIONAL ENGINEERING, MS

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

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.

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.

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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The MS degree takes at least two semesters and a summer session to complete and normally takes three semesters and a summer session. The curriculum requires courses covering the fundamentals of nuclear engineering and interaction of radiation with matter, plus additional courses in an area of concentration chosen by the student in consultation with an advisor. Typical areas are:

- fission engineering including reactor physics and radiation transport
- reactor analysis, thermal hydraulics, and reactor safety
- fuel cycles, radiation effects, and radioactive waste management
- fusion engineering and technology
- plasma engineering and processing
- nuclear materials, corrosion, and irradiation damage
- neutron scattering
- nuclear nonproliferation and public policy issues
- radiation detector development and homeland security applications
- biomedical imaging, MRI applications, radiation protection, radiation-based therapy, and health physics
- reliability and risk analysis and probabilistic risk assessment
- computational methods including Lie Group, integral-differential equation, Monte Carlo, big data and fuzzy logic applications.

For additional details and requirements refer to the department’s printed handbook and the Graduate College Handbook (http://grad.illinois.edu/gradhandbook/).

Requirements

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>NPRE 599</td>
<td>Thesis Research (min-max applied toward degree)</td>
<td>4-8</td>
</tr>
<tr>
<td>NPRE 501</td>
<td>Fundamentals of Nuclear Engr &amp; Interact of Radiation w/Matter</td>
<td>8</td>
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<tr>
<td>&amp; NPRE 521</td>
<td></td>
<td></td>
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<tr>
<td>NPRE 596</td>
<td>Seminar in Nuclear Sci &amp; Engr (registration for 1 hour every semester while in residence; credit does not apply toward the degree.)</td>
<td>0</td>
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<tr>
<td>Two or more NPRE courses in an area of concentration</td>
<td>8</td>
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<tr>
<td>Additional 500-level courses</td>
<td>8</td>
<td></td>
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<tr>
<td>Elective courses (subject to Other Requirements and Conditions below)</td>
<td>0-4</td>
<td></td>
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<tr>
<td>Total Hours</td>
<td>32</td>
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Other Requirements and Conditions

Minimum GPA: 2.75

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1. Ability to apply knowledge of mathematics, science and engineering
2. Ability to design and conduct experiments and/or computational projects; analyze and interpret data
3. Ability to communicate effectively
4. Demonstrate ability to conduct independent research in a nuclear, plasma or radiological field
5. Ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety

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. Please contact the department (nuclear@illinois.edu) for
information regarding whether or not the Graduate Record Exam (GRE)
(http://www.ets.org/) is required for the current application cycles.
Information such as undergraduate class rank is recommended.

For full consideration of fall admission with financial aid, application
receipt deadline is December 15th. The final deadline for fall admission
is February 15th. 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/). 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. Part- and full-time assistantships include tuition
and partial fee waivers.

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),
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.

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

- degrees:
  - Nuclear, Plasma, & Radiological Engineering, PhD (http://
catalog.illinois.edu/graduate/engineering/nuclear-plasma-
radiological-engineering-phd/)
  - optional concentrations:
    - Computational Science & Engineering (http://catalog.illinois.edu/
      graduate/engineering/concentration/computational-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/)