NUCLEAR ENGINEERING MINOR

http://www.me.iastate.edu/students/degrees-and-programs/engineering-minors/

Minor administered by Mechanical Engineering

The nuclear engineering undergraduate minor allows engineering students to acquire a formal background in nuclear engineering topics that will not only benefit them, but also fulfill a societal need for future hiring of engineers. Through this program, students can enroll in a formal minor that enables them to acquire a basic and fundamental knowledge of nuclear sciences and engineering, thus enabling them to pursue employment in any one of a number of fields associated with the construction, operation or regulation of nuclear power generation.

Students completing this minor acquire a body of knowledge in the fundamentals of nuclear science and engineering. The required courses selected ensures that all graduates of the nuclear engineering minor obtain a minimum body of knowledge in nuclear science and engineering that would allow them to apply their specialized field of engineering knowledge to nuclear-related applications, such as nuclear plant and site construction, nuclear power plant operations, nuclear safety and radiation protection.

The supporting courses that are listed in this program provide an opportunity for students to build upon the knowledge gained in the required courses by taking either more advanced courses or more specialized courses dealing with specific areas of nuclear engineering.

Undergraduate Study

Students interested in completing the nuclear engineering minor must be enrolled at Iowa State University and have the appropriate technical background. They should complete and submit the “Request for Minor” form for submission to the Nuclear Engineering program director. The selection process is based on approval by the administering department, Mechanical Engineering.

The course requirements for the undergraduate minor in nuclear engineering are:

Required course:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>NUC E 401</td>
<td>Nuclear Radiation Theory and Engineering</td>
<td>3</td>
</tr>
</tbody>
</table>

Four of the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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</tr>
</thead>
<tbody>
<tr>
<td>NUC E 402</td>
<td>Nuclear Reactor Engineering *</td>
<td>3</td>
</tr>
<tr>
<td>NUC E 405</td>
<td>Radiation Protection and Shielding *</td>
<td>3</td>
</tr>
<tr>
<td>NUC E 410</td>
<td>Nuclear Reactor Theory *</td>
<td>3</td>
</tr>
<tr>
<td>NUC E 421</td>
<td>Nuclear Criticality Safety</td>
<td>3</td>
</tr>
</tbody>
</table>

Total Credits 15

*Students have the option of enrolling in these web-based distance courses offered at select universities. It is the responsibility of the student to arrange for enrollment and payment for these courses. Courses must be successfully completed with a “C” or higher in order to be considered for transfer credit. Contact the Nuclear Engineering program director for more information.

The minor must include at least nine credits which are beyond the total used to meet curriculum requirements for the bachelors degree in engineering.

Courses primarily for undergraduates:

NUC E 401: Nuclear Radiation Theory and Engineering
(3-0) Cr. 3. F.
Prereq: PHYS 222, MATH 266 or MATH 267

NUC E 402: Nuclear Reactor Engineering
(3-0) Cr. 3. S.
Prereq: NUC E 401, permission of Nuclear Engineering program director

NUC E 405: Radiation Protection and Shielding
(3-0) Cr. 3.
Prereq: NUC E 401, permission of Nuclear Engineering program director
WWW only. Basic principles and concepts of radiation protection and design: dosimetric units and response functions, hazards of radiation dose, radiation sources, basic methods for dose evaluation, and shielding design techniques for photons and neutrons.

NUC E 410: Nuclear Reactor Theory
(3-0) Cr. 3. F.
Prereq: NUC E 401, permission of Nuclear Engineering program director
WWW only. An introduction to neutron diffusion theory, neutron moderation, conditions for criticality of nuclear reactors.
NUC E 421: Nuclear Criticality Safety
Cr. 3. F.
Prereq: NUC E 401
Nomenclature, theory, and practice of nuclear criticality safety. Review
of nuclear criticality accidents, analytical methods used in criticality
analysis, review of standards and regulations, and developing criticality
safety evaluations.

NUC E 430: Nuclear Energy and Society
(3-0) Cr. 3. Alt. S., offered even-numbered years.
Prereq: NUC E 401
The relationship between nuclear energy and society is examined
from the perspective of significant events in the commercial nuclear
power industry. Event analysis includes differences and similarities of
technologies along with environmental impact. Political, social, media
and regulatory responses for each event are discussed along with the
impact on future plant design.

NUC E 441: Probabilistic Risk Assessment
(3-0) Cr. 3. S.
Prereq: STAT 305 or equivalent
Methods for analysis of nuclear power systems. Fault tree and event tree
analysis methods. Mathematical basics for dealing with reliability data,
time, and analysis. Case studies of accidents in nuclear power systems.

NUC E 461: Radiation Detection, Measurement and Simulation
(3-0) Cr. 3. S.
Prereq: NUC E 401
Principles of nuclear radiation safety and detection. Radiation energy
spectroscopy. Counting statistics and error analysis. Monte Carlo
simulation of radiation transport. Detection system performance
parameters. Design projects.

NUC E 490: Independent Study
Cr. 1-3. Repeatable, maximum of 3 credits.
Prereq: Junior Classification
Investigation of nuclear engineering topics. Election of course and topic
must be approved in advance by supervising faculty.