NUCLEAR ENGINEERING

Nuclear engineering includes the design, development and operation of nuclear power systems; numeric simulation of nuclear systems; health physics and radiation protection; radiation imaging; radiation measurements; national security and non-proliferation; nondestructive examination of materials and structures using radiation techniques; use of radiation in medicine for treatment and diagnostics; and using radiation in food processing, industrial processing and manufacturing control.

About this Program

- **College:** Herbert Wertheim College of Engineering (https://catalog.ufl.edu/UGRD/colleges-schools/UGENG)
- **Degree:** Bachelor of Science in Nuclear Engineering
- **Credits for Degree:** 127
- **Additional Information**
- **Related Nuclear Engineering and Science Programs**

To graduate with this major, students must complete all university, college, and major requirements.

A full complement of experimental facilities is available, including a 100 KW research and training reactor, a neutron activation analysis laboratory and a D-D neutron source for radiation studies. The department also has specialized nuclear instrumentation in the radiation detection laboratories located in the Nuclear Science Building and the Nuclear Field Building.

Students should concentrate electives in one discipline to achieve solid familiarity in a minor field of study. These electives, chosen with an advisor, allow option area specialization in reactor engineering, reactor operations, radioisotopes and nuclear radiation technology, and radiation and biological systems.

Transfer Admission Requirements

It is the department's policy to admit the best-qualified transfer applicants as demonstrated by academic achievement. Successful applicants must have earned:

- An overall 2.5 grade point average, based on the first two attempts in the eight preprofessional (critical-tracking) courses;
- Minimum grades of C in the following. Only the first two attempts in each course, including withdrawals, will be considered for admission or retention in the department:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAC 2311</td>
<td>Analytic Geometry and Calculus 1</td>
<td>4</td>
</tr>
<tr>
<td>MAC 2312</td>
<td>Analytic Geometry and Calculus 2</td>
<td>4</td>
</tr>
<tr>
<td>MAC 2313</td>
<td>Analytic Geometry and Calculus 3</td>
<td>4</td>
</tr>
<tr>
<td>MAP 2302</td>
<td>Elementary Differential Equations</td>
<td>3</td>
</tr>
<tr>
<td>CHM 2045</td>
<td>General Chemistry 1</td>
<td>3</td>
</tr>
<tr>
<td>or CHM 2095</td>
<td>Chemistry for Engineers 1</td>
<td></td>
</tr>
<tr>
<td>CHM 2045L</td>
<td>General Chemistry 1 Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>Select one:</td>
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<td>3</td>
</tr>
<tr>
<td>CHM 2046</td>
<td>General Chemistry 2</td>
<td></td>
</tr>
<tr>
<td>or CHM 2096</td>
<td>Chemistry for Engineers 2</td>
<td></td>
</tr>
<tr>
<td>BSC 2010</td>
<td>Integrated Principles of Biology 1</td>
<td></td>
</tr>
</tbody>
</table>

- A cumulative minimum 2.0 GPA is required for all courses.

Department Requirements

- Minimum grades of C are required in the following:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>ENC 3246</td>
<td>Professional Communication for Engineers</td>
<td>3</td>
</tr>
<tr>
<td>ENU 4001</td>
<td>Nuclear Engineering Analysis 1</td>
<td>4</td>
</tr>
<tr>
<td>ENU 4191</td>
<td>Elements of Nuclear and Radiological Engineering Design</td>
<td>1</td>
</tr>
<tr>
<td>ENU 4192</td>
<td>Nuclear and Radiological Engineering Design</td>
<td>3</td>
</tr>
<tr>
<td>ENU 4605</td>
<td>Radiation Interactions and Sources 1</td>
<td>4</td>
</tr>
</tbody>
</table>

- The department encourages students to accept internships and opportunities to study abroad. It is highly recommended that students seek academic advising for appropriate registration planning.
- All nuclear engineering and nuclear radiological sciences majors must pass all required undergraduate department courses with an overall C average.
- All technical electives must be approved by a department advisor. At least six credits of technical electives must be ENU courses.

Educational Objectives

The Department of Nuclear and Radiological Engineering has established the following educational objectives for its undergraduate program.

Graduates will:

- Have successful careers in nuclear engineering or related disciplines
- Pursue continuing education or advanced degrees

Mission

The department will provide quality education and conduct nationally recognized research in nuclear and radiological engineering to serve the needs of Florida and the nation.

Related Nuclear Engineering and Science Programs

- Combined Degree (http://catalog.ufl.edu/UGRD/academic-programs/combined-degrees)
- Bachelor of Science in Nuclear and Radiological Sciences (http://catalog.ufl.edu/UGRD/colleges-schools/UGENG/NRA_BS)
- Nuclear and Radiological Engineering minor (http://catalog.ufl.edu/UGRD/colleges-schools/UGENG/NURE_UMN)
- Nuclear Radiation and Reactor Analysis certificate (http://catalog.ufl.edu/UGRD/colleges-schools/UGENG/NURE_UMN)

Critical Tracking

Critical Tracking records each student's progress in courses that are required for entry to each major. Please note the critical-tracking requirements below on a per-semester basis.

Equivalent critical-tracking courses as determined by the State of Florida Common Course Prerequisites (http://www.flvc.org/cpp/displayRecord.jsp?cip=142301&track=01) may be used for transfer students.
Semester 1

• Complete 1 of 8 critical-tracking courses with a minimum grade of C within two attempts: CHM 2045 or CHM 2095, CHM 2046 or CHM 2096 or BSC 2010; MAC 2311, MAC 2312, MAC 2313, MAP 2302, PHY 2048, PHY 2049
• 2.5 GPA required for all critical-tracking courses
• 2.0 UF GPA required

Semester 2

• Complete 1 additional critical-tracking course with a minimum grade of C within two attempts
• 2.5 GPA required for all critical-tracking courses
• 2.0 UF GPA required

Semester 3

• Complete 2 additional critical-tracking courses with minimum grades of C within two attempts
• 2.5 GPA required for all critical-tracking courses
• 2.0 UF GPA required

Semester 4

• Complete 2 additional critical-tracking courses with minimum grades of C within two attempts
• 2.5 GPA required for all critical-tracking courses
• 2.0 UF GPA required

Semester 5

• Complete all 8 critical-tracking courses with minimum grades of C in each course within two attempts
• 2.5 GPA required for all critical-tracking courses
• 2.0 UF GPA required

Model Semester Plan

Students are expected to complete the general education international (GE-N) and diversity (GE-D) requirements. This is often done concurrently with another general education requirement (typically, GE-C, H or S).

To remain on track, students must complete the appropriate critical-tracking courses, which appear in bold. These courses must be completed by the terms as listed above in the Critical Tracking criteria.

This semester plan represents an example progression through the major. Actual courses and course order may be different depending on the student’s academic record and scheduling availability of courses. Prerequisites still apply.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>Semester One</td>
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<td>3</td>
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<tr>
<td>CHM 2045</td>
<td>General Chemistry 1 (Critical Tracking; Gen Ed Biological Sciences and Physical Sciences)</td>
<td>3</td>
</tr>
<tr>
<td>CHM 2095</td>
<td>Chemistry for Engineers 1 (Critical Tracking; Gen Ed Biological Sciences and Physical Sciences)</td>
<td>3</td>
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<tr>
<td>CHM 2045L</td>
<td>General Chemistry 1 Laboratory (Gen Ed Physical Sciences)</td>
<td>1</td>
</tr>
<tr>
<td>ENU 1000</td>
<td>Introduction to Nuclear Engineering</td>
<td>1</td>
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</tbody>
</table>
Semester Five
EGM 3520 Mechanics of Materials 3
EMA 3010 Materials 3
Gen Ed Social and Behavioral Sciences with International; Writing Requirement: 6,000 words 3
Semester Six
EEL 3003 Elements of Electrical Engineering 3
EGN 3353C Fluid Mechanics 3
EGS 4034 Engineering Ethics and Professionalism 1
ENU 4001 Nuclear Engineering Analysis 1 4
ENU 4605 Radiation Interactions and Sources 1 4
Credits 9
Semester Seven
EML 4140 Heat Transfer 3
ENU 4103 Reactor Analysis and Computation 1: Statics 4
ENU 4144 Nuclear Power Plant Reactor Systems 1 3
ENU 4800 Introduction to Nuclear Reactor Materials 3
technical elective 3
Credits 15
Semester Eight
ENU 4134 Reactor Thermal Hydraulics 4
ENU 4191 Elements of Nuclear and Radiological Engineering Design 1
ENU 4612 Nuclear Radiation Detection and Instrumentation 3
ENU 4612L Nuclear Radiation Detection and Instrumentation Laboratory 1
ENU 4630 Fundamental Aspects of Radiation Shielding 3
technical elective 3
Credits 16
Semester Nine
ENU 4145 Risk Assessment for Radiation Systems 3
ENU 4192 Nuclear and Radiological Engineering Design 3
ENU 4505L Nuclear and Radiological Engineering Laboratory 1 (Writing Requirement: 4,000 words) 3
ENU 4641C Applied Radiation Protection (Writing Requirement: 2,000 words) 2
technical elective 3
Credits 15
Total Credits 127

Technical Electives
The choice of engineering science and technical electives allows emphasis in nuclear power engineering, nuclear instrumentation, criticality safety safeguards, radiation imaging, plasmas/fusion, advanced nuclear reactor concepts and non-proliferation.

Of the nine credits of technical electives required, six credits must be ENU courses 3000-level or above. A maximum of three credits, combined, may come from ENU 4905 or ENU 4949. The final three credits may be any engineering (including ENU), mathematics or science course 3000-level or above.

ACT/SAT Placement scores do not exempt this requirement.

Academic Learning Compact
The major in nuclear engineering educates students to work professionally in areas related to the control and safe utilization of nuclear energy, radiation and radioactivity.


ABET EAC Program Educational Objectives, Student Outcomes, and Enrollment and Graduation Numbers can be found on the college website (https://www.eng.ufl.edu/academics/degree-programs/accreditation).

Before Graduating Students Must
- Pass an assessment by two or more faculty and/or industry practitioners of performance on a major design experience.
- Pass assessment in two or more courses of individual assignments targeted to each learning outcome. Assessment will be provided by the instructor of the course according to department standards.
- Complete an exit interview in your final semester.
- Complete requirements for the baccalaureate degree, as determined by faculty.

Students in the Major Will Learn to

Student Learning Outcomes (SLOs)

Content
1. Apply knowledge of mathematics, science and engineering for problem solving in engineering.
2. Design and conduct experiments and analyze and interpret experimental data.

Critical Thinking
3. Develop an engineering design to meet specific technical requirements within realistic constraints such as economic, environmental, health and safety and reliability.
4. Foster the need for lifelong learning and the ability to adapt this to engineering practice.

Communication
5. Function effectively on multidisciplinary skills teams.
6. Communicate effectively, using both oral and written presentations, in engineering practice.

Curriculum Map

<table>
<thead>
<tr>
<th>Courses</th>
<th>SLO 1</th>
<th>SLO 2</th>
<th>SLO 3</th>
<th>SLO 4</th>
<th>SLO 5</th>
<th>SLO 6</th>
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<tbody>
<tr>
<td>ENU 4001 I</td>
<td>I</td>
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<tr>
<td>ENU 4103 R</td>
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<td>ENU 4133</td>
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<td>ENU 4192 A</td>
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<tr>
<td>ENU 4505 i</td>
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<tr>
<td>ENU 4612 C</td>
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I = Introduced; R = Reinforced; A = Assessed
Assessment Types

- Instructor’s outcome scorecards
- Senior exit survey