

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 (<http://catalog.ufl.edu/UGRD/colleges-schools/UGENG/>)
- **Degree:** Bachelor of Science in Nuclear Engineering
- **Credits for Degree:** 127

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

Department Information

The Department of Materials Science and Engineering strives to serve the scientific and engineering community of the state and nation by providing quality education in the field, conducting basic and applied research to enhance science in the field, and supplying short courses, technology transfer, industrial consulting, and distance learning to promote engineering in the field.

Website (<https://mse.ufl.edu/>)

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Map (<http://campusmap.ufl.edu/#/index/0184>)

Curriculum

- Advanced Engineering Ceramics Certificate
- Biomaterials Certificate
- Combination Degrees
- Materials Science and Engineering
- Materials Science and Engineering Minor
- Metallurgical Engineering Certificate
- Nuclear and Radiological Engineering Minor
- Nuclear and Radiological Sciences
- Nuclear Engineering
- Nuclear Radiation and Reactor Analysis Certificate
- Nuclear Thermal Systems Analysis Certificate
- Polymer Science and Engineering Certificate
- Semiconductor Materials Certificate

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 to or retention in the department:

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

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

Department Requirements

- Minimum grades of C are required in the following:

Code	Title	Credits
ENC 3246	Professional Communication for Engineers	3
ENU 4001	Nuclear Engineering Analysis 1	4
ENU 4191	Elements of Nuclear and Radiological Engineering Design	1
ENU 4192	Nuclear and Radiological Engineering Design	3
ENU 4605	Radiation Interactions and Sources 1	4

- 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.

Critical Tracking

Critical Tracking records each student's progress in courses that are required for progress toward 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

Semester 6

- Complete ENU 4001 and ENU 4605 with a minimum grade of C

Semester 7

- Complete 2 additional 4000 level ENU courses

Semester 8

- Complete 2 additional 4000 level ENU courses

Semester 9

- Complete all remaining 4000 level ENU required courses

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.

Course	Title	Credits
Semester One		
Quest 1 (Gen Ed Humanities); Writing Requirement: 2,000 words; with International or Diversity		3
Select one:		3
CHM 2045	General Chemistry 1 (Critical Tracking ; Gen Ed Biological Sciences and Physical Sciences)	
CHM 2095	Chemistry for Engineers 1 (Critical Tracking ; Gen Ed Biological Sciences and Physical Sciences)	
CHM 2045L	General Chemistry 1 Laboratory (Gen Ed Physical Sciences)	1
ENU 1000	Introduction to Nuclear Engineering	1
MAC 2311	Analytic Geometry and Calculus 1 (Critical Tracking ; State Core Gen Ed Mathematics)	4
State Core Gen Ed Composition (http://catalog.ufl.edu/UGRD/academic-programs/general-education/#genedcoursestext); Writing Requirement: 6,000 words ¹		3
Credits		15
Semester Two		
Quest 2 (Gen Ed Social/Behavioral Science); Writing Requirement 2,000 words; with International or Diversity		3
ENC 3246	Professional Communication for Engineers (Gen Ed Composition; Writing Requirement: 6,000 words)	3
MAC 2312	Analytic Geometry and Calculus 2 (Critical Tracking ; Gen Ed Mathematics)	4
PHY 2048	Physics with Calculus 1 (Critical Tracking ; Gen Ed Biological Sciences and Physical Sciences)	3
PHY 2048L	Laboratory for Physics with Calculus 1 (Gen Ed Biological and Physical Sciences)	1
Credits		14
Semester Three		
ENU 4934	Fundamentals of Nuclear and Radiological Engineering	1
MAC 2313	Analytic Geometry and Calculus 3 (Critical Tracking ; Gen Ed Mathematics)	4

PHY 2049	Physics with Calculus 2 (Critical Tracking; Gen Ed Biological Sciences and Physical Sciences)	3
PHY 2049L	Laboratory for Physics with Calculus 2 (Gen Ed Biological and Physical Sciences)	1
STA 3032	Engineering Statistics	3
State Core Gen Ed Humanities; Writing Requirement: 2,000 words or more		3
Credits		15

Semester Four

Select one:		3
BSC 2010	Integrated Principles of Biology 1 (Critical Tracking; Gen Ed Biological Sciences and Physical Sciences)	
CHM 2046	General Chemistry 2 (Critical Tracking; Gen Ed Biological Sciences and Physical Sciences)	
CHM 2096	Chemistry for Engineers 2 (Critical Tracking; Gen Ed Biological Sciences and Physical Sciences)	
COP 2271	Computer Programming for Engineers	2
EGM 2511	Engineering Mechanics: Statics	3
EML 3100	Thermodynamics	3
MAP 2302	Elementary Differential Equations (Critical Tracking)	3
Credits		14

Semester Five

EGM 3520	Mechanics of Materials	3
EMA 3010	Materials	3
State Core Gen Ed Social and Behavioral Sciences (http://catalog.ufl.edu/UGRD/academic-programs/general-education/#genedcoursestext)		3
Credits		9

Semester Six

EEL 3003	Elements of Electrical Engineering	3
EEN 3353C	Fluid Mechanics	3
EGS 4034	Engineering Ethics and Professionalism	1
ENU 4001	Nuclear Engineering Analysis 1 (Critical Tracking)	4
ENU 4605	Radiation Interactions and Sources 1 (Critical Tracking)	4
Credits		15

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		16

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		15

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		14
Total Credits		127

¹ ACT/SAT Placement scores do not exempt this requirement.

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.

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.

Accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org> (https://urldefense.proofpoint.com/v2/url/?u=http-3A__www.abet.org&d=DwMGaQ&c=pZJPUDQ3SB9JpYbifm4nt2IEVG5pWx2Hf73BYn6kEY-D7Qfs6kPA&m=-KF2G1JwsXcME70kGBMIRYTy2i4YuuqEwzRran98WV1M&s=73PhSd8hcuNu3AXIyLs).

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.

- Design and conduct experiments and analyze and interpret experimental data.

Critical Thinking

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

Communication

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

Curriculum Map

I = Introduced; R = Reinforced; A = Assessed

Courses	SLO 1	SLO 2	SLO 3	SLO 4	SLO 5	SLO 6
ENU 4001 I						
ENU 4103 R			I	I		
ENU 4133						
ENU 4134		R	R	R		
ENU 4192 A			A	A	A	A
ENU 4505I		A			R	R
ENU 4612C		I			I	I

Assessment Types

- Instructor’s outcome scorecards
 - Senior exit survey
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