NUCLEAR AND RADIOLOGICAL ENGINEERING

EGN 6913 Engineering Graduate Research 0-3 Credits
Grading Scheme: S/U
Course will provide the student with supervised research in a laboratory setting.

ENU 5142 Reliability and Risk Analysis for Nuclear Facilities 3 Credits
Grading Scheme: Letter Grade
Nuclear facilities’ safety systems including reliability and probabilistic risk assessment.
Prerequisite: ENU 4144 or 5005 and 4934 or ENU 6935.

ENU 5176L Principles of Nuclear Reactor Operations Laboratory 1 Credit
Grading Scheme: Letter Grade
Principles of reactor operations applied to startup, operation, and control of the training reactor to include performing reactor physics measurements and instrumentation and control calibrations.
Prerequisite: ENU 4144 or equivalent and consent of instructor.

ENU 5186 Nuclear Fuel Cycles 3 Credits
Grading Scheme: Letter Grade
Fuel cycle from uranium mining through waste management. Reactor fuel cycle including economics and advanced fuel management. Nodal code evaluation of criticality, power peaking and power sharing through operating cycle, use of burnable poisons and reshuffle and reload for uranium and plutonium cycles.
Prerequisite: ENU 4104.

ENU 5196 Nuclear Reactor Power Plant System Dynamics and Control 3 Credits
Grading Scheme: Letter Grade
Control theory analysis applied to nuclear power reactor dynamic models with feedback and to integrated nuclear power plant dynamic models with feedback.
Prerequisite: ENU 4192 and EEL 4657 or EML 5311.

ENU 5516L Nuclear Engineering Laboratory II 2 Credits
Grading Scheme: Letter Grade
Laboratory practice in neutron and gamma detection and analysis. Determination of basic neutron parameters in nonmultiplying and multiplying media.
Prerequisite: ENU 4612L or ENU 5615L and 4104 or ENU 6106.

ENU 5615C Nuclear Radiation Detection and Instrumentation 4 Credits
Grading Scheme: Letter Grade
Interaction of radiation with matter, radiation-detection systems, pulse shaping, amplification, amplitude and time-analyzing circuitry; counting and measuring devices and control systems for nuclear reactors.
Prerequisite: ENU 3003 and EEL 3303L or equivalent.
Corequisite: ENU 6051; or prereq of ENU 4605 or equivalent.

ENU 6051 Radiation Interaction Basics and Applications 1 3 Credits
Grading Scheme: Letter Grade
Interaction of X-rays, gamma rays, neutrons, and charged particles with matter; radioactive decay, nuclear moments, and nuclear transitions. Application to basic problems in nuclear engineering sciences.

ENU 6052 Radiation Transport Basics and Applications 3 Credits
Grading Scheme: Letter Grade

ENU 6061 Survey of Medical Radiological Physics 1 Credit
Grading Scheme: Letter Grade
An overview of the areas of medical radiological physics including diagnostic radiography, nuclear medicine, and radiation therapy. Basic radiation physics, biology, and safety.
Prerequisite: undergraduate classical and modern physics, and differential equations.

ENU 6106 Nuclear Reactor Analysis I 3 Credits
Grading Scheme: Letter Grade
Nuclear criticality, neutron transport equation, multigroup neutron diffusion theory, and perturbation theory. Reactor kinetics: point model, reactivity feedback, and space-time models.
Prerequisite: ENU 6051.

ENU 6126 Fundamentals of Reactor Kinetics 3 Credits
Grading Scheme: Letter Grade
Nuclear reactor kinetics, including mathematics, transport and diffusion considerations, steady state and time dependent reactor physics, delayed neutron properties, photoneutrons, and neutron reactions, approximations and solutions to the kinetics equations, numerical solution methods using explicit, implicit, integral, marching, and finite difference solution methods.
Prerequisite: ENU 4001, ENU 4605, ENU 6103.

ENU 6135 Nuclear Thermal Hydraulics 4 Credits
Grading Scheme: Letter Grade
Treatment of nuclear thermal sciences: thermodynamics, fluid mechanics, heat transfer, two-phase flow, boiling; sub-channel thermal hydraulics, steam generator design, balance of plant analysis.
Prerequisite: EML 4140 and (ENU 4133 or EGN 3353C)

ENU 6136 Advanced Nuclear Thermal Hydraulics 3 Credits
Grading Scheme: Letter Grade
Topics in advanced nuclear thermal hydraulics, fluid mechanics, and heat transfer including areas of ongoing research and applications to current and future nuclear fission reactors.
Prerequisite: ENU 4134 or EGM 6812 or EML 6155 or ENU 6135

ENU 6627 Therapeutic Radiological Physics 3 Credits
Grading Scheme: Letter Grade
Prerequisite: ENU 5615C, ENU 6051.

ENU 6651 Clinical Rotation in Radiation Therapy 3 Credits
Grading Scheme: Letter Grade
Experience in clinical therapeutic radiological procedures, patient dosimetry, and treatment planning.
Prerequisite: working knowledge of therapeutic radiological physics.

ENU 6655 Advanced Diagnostic Radiological Physics 3 Credits
Grading Scheme: Letter Grade
Applying advanced physical principles, image acquisition, and processing techniques to clinical imaging physics. Methods and principles of MRI and ultrasound imaging. Digital image archiving, transmission and processing standards, and networks.
ENU 6835 Nuclear Fuels 3 Credits
Grading Scheme: Letter Grade
Survey of the nuclear fuels from ore to waste, including mining, pin design, fabrication, in-core performance, storage, disposal and fuel economics.

ENU 6905 Individual Work 1-6 Credits, Max 12 Credits
Grading Scheme: Letter Grade
Supervised study or research in areas not covered by other graduate courses.

ENU 6910 Supervised Research 1-5 Credits, Max 5 Credits
Grading Scheme: S/U
Supervised Research

ENU 6935 Nuclear and Radiological Engineering Seminar 1 Credit, Max 3 Credits
Grading Scheme: Letter Grade
Discussion of research, current trends in the nuclear related industry, government, and research establishments.

ENU 6936 Special Projects in Nuclear and Radiological Engineering Sciences 1-9 Credits, Max 12 Credits
Grading Scheme: Letter Grade
Nonthesis research projects.

ENU 6937 Special Topics in Nuclear and Radiological Engineering Sciences 1-9 Credits, Max 12 Credits
Grading Scheme: Letter Grade
Special Topics in Nuclear and Radiological Engineering Sciences

ENU 6971 Research for Master's Thesis 1-15 Credits
Grading Scheme: S/U
Research for Master’s Thesis

ENU 6972 Research for Engineer’s Thesis 1-15 Credits
Grading Scheme: S/U
Research for Engineer’s Thesis

ENU 7979 Advanced Research 1-12 Credits
Grading Scheme: S/U
Research for doctoral students before admission to candidacy. Designed for students with a master’s degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

ENU 7980 Research for Doctoral Dissertation 1-15 Credits
Grading Scheme: S/U
Research for Doctoral Dissertation