<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Description</th>
<th>Prerequisite(s)</th>
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<tr>
<td>NUC ENG 5000</td>
<td>Special Problems (IND 0.0-6.0)</td>
<td></td>
<td>Problems or readings on specific subjects or projects in the department. Consent of instructor required.</td>
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<tr>
<td>NUC ENG 5001</td>
<td>Special Topics (IND 0.0-6.0)</td>
<td></td>
<td>This course is designed to give the department an opportunity to test a new course. Variable title.</td>
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<tr>
<td>NUC ENG 5203</td>
<td>Reactor Physics I (LEC 3.0)</td>
<td></td>
<td>Study of neutron interactions, fission, chain reactions, neutron diffusion and neutron slowing down; criticality of a bare thermal homogeneous reactor. Prerequisite: Nuc Eng 3205.</td>
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<tr>
<td>NUC ENG 5207</td>
<td>Nuclear Fuel Cycle (LEC 3.0)</td>
<td></td>
<td>Nuclear fuel reserves and resources; milling, conversion, and enrichment; fuel fabrication; in-and out-of core fuel management; transportation, storage, and disposal of nuclear fuel; low level and high level waste management; economics of the nuclear fuel cycle. Prerequisite: Nuc Eng 3205.</td>
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<tr>
<td>NUC ENG 5241</td>
<td>Nuclear Materials I (LEC 3.0)</td>
<td></td>
<td>Fundamentals of materials selection for components in nuclear applications; design and fabrication of UO2 fuel; reactor fuel element performance; mechanical properties of UO2; radiation damage and effects, including computer modeling; corrosion of materials in nuclear reactor systems. Prerequisites: Civ Eng 2210; Nuc Eng 3205; Nuc Eng 3223; Met Eng 2110. (Co-listed with Met Eng 5170).</td>
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<tr>
<td>NUC ENG 5251</td>
<td>Reactor Kinetics (LEC 3.0)</td>
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<td>Derivation and solutions to elementary kinetics models. Application of the point kinetics model in fast and thermal reactor dynamics, internal and external feedback mechanisms, rigorous derivation and solutions of the space dependent kinetics model fission product and fuel isotope changes during reactor operation. Prerequisite: Nuc Eng 3205.</td>
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<tr>
<td>NUC ENG 5257</td>
<td>Introduction to Nuclear Thermal Hydraulics (LEC 3.0)</td>
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<td>An introductory course in the application of thermal-hydraulic principles to energy systems, with emphasis on nuclear energy issues. Will include the development of constitutive models and applications to power systems, fluid mechanics, and heat transfer problems (including multiphase flows). Prerequisite: Graduate standing.</td>
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<tr>
<td>NUC ENG 5281</td>
<td>Probabilistic Risk Assessment I (LEC 3.0)</td>
<td></td>
<td>A study of the techniques for qualitative and quantitative assessment of reliability, safety and risk associated with complex systems such as those encountered in the nuclear power industry. Emphasis is placed on fault tree analysis. Prerequisite: Nuc Eng 3205.</td>
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<tr>
<td>NUC ENG 5312</td>
<td>Nuclear Radiation Measurements and Spectroscopy (LAB 1.0 and LEC 2.0)</td>
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<td>Contemporary radiation detection theory and experiments with high resolution gamma-ray spectroscopy, solid state detectors, neutron detection and conventional gas filled detectors. Neutron activation analysis of unknown material, statistical aspects of nuclear measurements. Prerequisite: Nuc Eng 3205.</td>
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<tr>
<td>NUC ENG 5350</td>
<td>Advanced Nuclear Medical Science (LEC 3.0)</td>
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<td>Advanced level of technologies involved in medical modalities, such as digital radiography, digital mammography, modern computed tomography, gamma camera, SPECT and PET will be covered. Prerequisites: Nuc Eng 4312 or equivalent.</td>
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<tr>
<td>NUC ENG 5363</td>
<td>Applied Health Physics (LEC 3.0)</td>
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<td>Radiation sources; external and internal dosimetry; biological effects of radiation; radiation protection principles; regulatory guides; radioactive and nuclear materials management. Prerequisite: Nuc Eng 3103 or Physics 2305.</td>
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<tr>
<td>NUC ENG 5367</td>
<td>Radioactive Waste Management And Remediation (LEC 3.0)</td>
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<td>Sources and classes of radioactive waste, long-term decay, spent fuel storage, transport, disposal options, regulatory control, materials issues, site selection and geologic characterization, containment, design and monitoring requirements, domestic and foreign waste disposal programs, economic and environmental issues, history of disposal actions, and conduct of remedial actions and clean up. Prerequisite: Math 3304. (Co-listed with Geology 4421).</td>
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<tr>
<td>NUC ENG 5370</td>
<td>Plasma Physics I (LEC 3.0)</td>
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<td>Single particle orbits in electric and magnetic fields, moments of Boltzmann equation and introduction to fluid theory. Diffusion of plasma in electric and magnetic fields. Analysis of laboratory plasmas and magnetic confinement devices. Introduction to plasma kinetic theory. Prerequisite: Aero Eng 3131 or Mech Eng 3131 or Physics 3211 or Nuc Eng 3221 or Elec Eng 3600. (Co-listed with Aero Eng 5570, Mech Eng 5570, Physics 4543).</td>
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<tr>
<td>NUC ENG 5428</td>
<td>Reactor Laboratory I (LEC 1.0 and LAB 1.0)</td>
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<td>Acquaints the student with neutron flux measurement, reactor operation, control rod calibration, reactor power measurement and neutron activation experiments. Experiments with the thermal column and neutron beam port are also demonstrated. Prerequisites: Nuc Eng 4312, 3205.</td>
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<tr>
<td>NUC ENG 5438</td>
<td>Reactor Laboratory II (LEC 1.0 and LAB 1.0)</td>
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<td>A continuation of Nuclear Engineering 304 with experiments of a more advanced nature. Prerequisite: Nuc Eng 4428.</td>
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NUC ENG 5456 Reactor Operation II (LAB 1.0)
The operation of the training reactor. The program is similar to that
required for the NRC Reactor Operator’s license. Students from other
disciplines will also benefit from the course. Prerequisite: Nuc Eng 2105,
2406.

NUC ENG 5507 Nuclear Policy (LEC 3.0)
This course introduces nuclear security and safeguards policy. It explores
the following topics: history of domestic and international nuclear policy,
evolution of U.S. nuclear weapons policy, factors influencing policy, the
IAEA, nuclear deterrence policy, nuclear safeguards policy, policy in non-
proliferation issues, and various international agreements. Prerequisites:
Graduate Standing or enrolled in the Nuclear Nonproliferation certificate
program.

NUC ENG 5509 Nuclear Nonproliferation (LEC 3.0)
This course will introduce IAEA mission specific to nonproliferation.
The class will provide discussion of essential elements of a nuclear
weapon, followed by a brief historical over of nonproliferation treaties
in place to deter proliferation. Methods of fissile material production
will be discussed followed by a survey of tool and techniques available
an Prerequisites: Graduate Standing or enrolled in the Nuclear
Nonproliferation certificate program.

NUC ENG 5577 Advanced Nuclear Forensics and Radiochemistry (LEC 3.0)
Fundamentals of radiochemistry, including nuclear science,
cosmochimistry, spent fuel reprocessing, with details on solvent
extraction. We will review case studies in Nuclear Forensics. This
advanced section also includes experiments on radiochemistry and
demonstrate experimental nuclear forensics techniques. Dual listed with
Nuc Eng 4577.

NUC ENG 6000 Special Problems (IND 0.0-6.0)
Problems or readings on specific subjects or projects in the department.
Consent of instructor required.

NUC ENG 6001 Special Topics (LEC 0.0-6.0)
This course is designed to give the department an opportunity to test a
new course. Variable title.

NUC ENG 6010 Seminar (RSD 0.0-6.0)
Discussion of current topics.

NUC ENG 6040 Oral Examination (IND 0.0)
After completion of all other program requirements, oral examinations for
on-campus M.S./Ph.D. students may be processed during intersession.
Off-campus M.S. students must be enrolled in oral examination and
must have paid an oral examination fee at the time of the defense/
comprehensive examination (oral/ written). All other students must enroll
for credit commensurate with uses made of facilities and/or faculties. In
no case shall this be for less than three (3) semester hours for resident
students.

NUC ENG 6050 Continuous Registration (IND 1.0)
Doctoral candidates who have completed all requirements for the degree
except the dissertation, and are away from the campus must continue
to enroll for at least one hour of credit each registration period until the
degree is completed. Failure to do so may invalidate the candidacy. Billing
will be automatic as will registration upon payment.

NUC ENG 6085 Internship (IND 0.0-15)
Students working toward a doctor of engineering degree will select with
the advice of their committees, appropriate problems for preparation of a
dissertation. The problem selected and internship plan must conform to
the purpose of providing a high level engineering experience consistent
with the intent of the doctor of engineering degree.

NUC ENG 6099 Research (IND 0.0-15)
Investigations of an advanced nature leading to the preparation of a
thesis or dissertation. Consent of instructor required.

NUC ENG 6203 Advanced Reactor Physics (LEC 3.0)
Transport and diffusion theory; multigroup approximation; criticality
calculations; cross-section processing; buildup and depletion
calculations; delayed neutrons and reactor kinetics; lattice physics
calculations; full core calculations; analysis and measurement of
reactivity coefficients. Prerequisite: Math 5325.

NUC ENG 6205 Linear Transport Theory (LEC 3.0)
Monoenergetic Boltzmann equation for neutral particles by the method of
singular eigen-functions and polynomial expansions. Prerequisites: Nuc
Eng 4203, Math 5358.

NUC ENG 6223 Nuclear Reactor Safety (LEC 3.0)
Study of safety criteria; reactor characteristics pertinent to safety; reactor
transient behavior; loss of coolant accident analysis; emergency core
cooling; fuel behavior during accident conditions; reactor risk analysis;
current reactor safety issues. Prerequisites: Nuc Eng 4203 and 3229.

NUC ENG 6241 Effects Of Radiation On Solids (LEC 3.0)
The theories of the interaction of nuclear radiation with matter.
Experimental approaches to radiation studies, including the sources and
dosimetry. Nature and properties of crystal imperfections. The influence
of radiation on physical, mechanical and surface properties of metals and
alloys. Radiation effects on materials other than those incorporated in
nuclear reactors. The annealing of defects. Prerequisite: Met Eng 5170.

NUC ENG 6257 Advanced Nuclear Thermal Hydraulics (LEC 3.0)
Treatment of advanced topics in nuclear reactor thermal-hydraulics
including analysis of fuel elements and fuel melting, multiphase flow
dynamics and two-fluid models, interfacial transfer of mass, momentum,
and energy, multiphase flow scaling, and numerical applications.
Prerequisite: Math 5325.

NUC ENG 6323 Plasma Physics (LEC 3.0)
Fundamentals of kinetic, theory, fluid equations, MHD equations, and
applications: wave propagation, shielding effect, diffusion, stability, and
charged particle trajectories. Prerequisite: Nuc Eng 4361 for Nuc Eng;
Physics 4211 for Physics.
NUC ENG 6331 Radiation Shielding (LEC 3.0)
Radiation sources; interactions of radiation with matter; dosimetry and radiation protection guidelines. The particle transport equation and methods of solving it; the Monte Carlo Method; special computational methods for neutron and gamma attenuation. Computer codes used in shielding. Shielding materials, shield design. Prerequisite: Nuc Eng 4203.