**Class Schedule - Fall 2017**

**Nuclear, Plasma, and Radiological Engineering**

Nuclear, Plasma, and Radiological Engineering  
Head of Department: James F. Stubbins  
Department Office: 216 Talbot Laboratory, 104 South Wright, Urbana  
Phone: 217-333-2295  
www.npre.illinois.edu

**NPRE 100  Orientation to NPRE  credit: 1 hours.**  
Introduction to nuclear, plasma, and radiological engineering. Demonstrations and discussion of nuclear phenomena (reactor operation, plasma behavior, and others). Experiments on radioactive decay and radiation shielding with formal laboratory report and a student project.

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<tr>
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<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>32850</td>
<td>Lecture-Discussion</td>
<td>A</td>
<td>03:30 PM - 04:50 PM</td>
<td>R</td>
<td>153 - Mechanical Engineering Bldg</td>
<td>Kozlowski, T</td>
</tr>
</tbody>
</table>

Restricted to Undergrad - Urbana-Champaign.

**NPRE 201  Energy Systems  credit: 2 or 3 hours.**  
Patterns of energy production and utilization and technical aspects of renewable energy resources, advanced fossil fuel systems, and advanced nuclear systems. Same as GLBL 201. Prerequisite: MATH 220 or MATH 221; one of PHYS 101, PHYS 211, CHEM 104, CHEM 204, ME 300.

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<tr>
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<th>Location</th>
<th>Instructor</th>
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</thead>
<tbody>
<tr>
<td>48084</td>
<td>Lecture-Discussion</td>
<td>I</td>
<td>04:00 PM - 05:50 PM</td>
<td>MTWR</td>
<td>225A - Talbot Laboratory</td>
<td>Stubbins, J</td>
</tr>
</tbody>
</table>

Credit Hours: 2 hours  
Restricted to Undergrad - Urbana-Champaign.  
Meets 28-Aug-17 - 20-Oct-17.  
This course is also offered over the summer through a study abroad program to Pisa, Italy with Professor Stubbins. Please visit www.studyabroad.illinois.edu and search Pisa for more information. Application deadline is March 27, 2017.

<table>
<thead>
<tr>
<th>CRN</th>
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<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>30493</td>
<td>Lecture-Discussion</td>
<td>Q</td>
<td>12:00 PM - 12:50 PM</td>
<td>MW</td>
<td>103 - Talbot Laboratory</td>
<td>Allain, J</td>
</tr>
</tbody>
</table>

Credit Hours: 2 hours  
Restricted to Undergrad - Urbana-Champaign.  
This course is also offered over the summer through a study abroad program to Pisa, Italy with Professor Stubbins. Please visit www.studyabroad.illinois.edu and search Pisa for more information. Application deadline is March 27, 2017.

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<th>Location</th>
<th>Instructor</th>
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</thead>
<tbody>
<tr>
<td>49708</td>
<td>Discussion/Recitation</td>
<td>Q2</td>
<td>12:00 PM - 12:50 PM</td>
<td>F</td>
<td>106B8 - Engineering Hall</td>
<td></td>
</tr>
</tbody>
</table>

Credit Hours: 3 hours  
Restricted to Undergrad - Urbana-Champaign.
NPRE 247  **Modeling Nuclear Energy System**  credit: 3 hours.

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<th>Location</th>
<th>Instructor</th>
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</thead>
<tbody>
<tr>
<td>54919</td>
<td>Lecture-Discussion</td>
<td>C</td>
<td>10:00 AM - 10:50 AM</td>
<td>MWF</td>
<td>305 - Materials Science &amp; Eng Bid</td>
<td>Kozlowski, T</td>
</tr>
</tbody>
</table>

Restricted to Undergrad - Urbana-Champaign.

NPRE 397  **Independent Study**  credit: 1 TO 4 hours.
Individual investigations or studies of any phase of nuclear engineering selected by the student and approved by the department. May be repeated. Prerequisite: Consent of instructor.

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<th>CRN</th>
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<th>Location</th>
<th>Instructor</th>
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</thead>
<tbody>
<tr>
<td>10071</td>
<td>Independent Study</td>
<td></td>
<td>ARRANGED -</td>
<td></td>
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</tbody>
</table>

Departmental Approval Required

NPRE 402  **Nuclear Power Engineering**  credit: 3 OR 4 hours.
Principles of utilization of fission energy in nuclear power engineering; includes such topics as fission processes and controlled chain reactions; nuclear reactor types, design principles, and operational characteristics; power reactor design criteria; radiation hazards and radioactive waste treatment; economics; other applications such as propulsion and research reactors. 3 undergraduate hours. 4 graduate hours. Credit is not given for both NPRE 402 and NPRE 247.

<table>
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<tr>
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<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>34302</td>
<td>Lecture-Discussion</td>
<td>A</td>
<td>08:00 AM - 08:50 AM</td>
<td>MWF</td>
<td>103 - Talbot Laboratory</td>
<td>Ragheb, M</td>
</tr>
</tbody>
</table>

Credit Hours: 3 hours
Restricted to Undergrad - Urbana-Champaign.
Section restricted to Undergrads

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<tr>
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<th>Instructor</th>
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</thead>
<tbody>
<tr>
<td>43004</td>
<td>Lecture-Discussion</td>
<td>D4</td>
<td>08:00 AM - 08:50 AM</td>
<td>MWF</td>
<td>103 - Talbot Laboratory</td>
<td>Ragheb, M</td>
</tr>
</tbody>
</table>

Credit Hours: 4 hours
Restricted to Graduate - Urbana-Champaign.
Section restricted to graduate students

NPRE 412  **Nuclear Power Econ & Fuel Mgmt**  credit: 3 OR 4 hours.
Quantitative analysis of the impact of the nuclear power industry; nuclear fuel cycle and capital costs for thermal and fast reactors; optimization of the use of nuclear fuels to provide the lowest energy costs and highest system performance; comparison between fossil fuel systems, fission systems, and controlled thermonuclear fusion systems. 3 undergraduate hours. 4 graduate hours. Prerequisite: NPRE 402 or NPRE 247. Junior standing is required.
NPRE 423  **Plasma Laboratory**  credit: 2 hours.
Experiments relating to plasma engineering and fusion energy. Topics in ultra-high vacuum technology rf and dc electric plasma probes, measurements of dc and pulsed magnetic fields, dynamics of a theta pinch, and laser interferometry to measure plasma density. 2 undergraduate hours. 2 graduate hours. Prerequisite: NPRE 421 and NPRE 451.

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<tbody>
<tr>
<td>43007</td>
<td>Laboratory</td>
<td>ABA</td>
<td>ARRANGED -</td>
<td></td>
<td>ARR - Roger Adams Laboratory</td>
<td>Ruzic, D</td>
</tr>
<tr>
<td>43008</td>
<td>Laboratory</td>
<td>ABB</td>
<td>12:00 PM - 03:50 PM</td>
<td>T</td>
<td>114 - Nuclear Radiations Laboratory</td>
<td>Ruzic, D</td>
</tr>
<tr>
<td>43009</td>
<td>Laboratory</td>
<td>ABC</td>
<td>04:00 PM - 07:50 PM</td>
<td>R</td>
<td>-</td>
<td>Ruzic, D</td>
</tr>
<tr>
<td>60915</td>
<td>Laboratory</td>
<td>ABD</td>
<td>04:00 PM - 07:50 PM</td>
<td>T</td>
<td>114 - Nuclear Radiations Laboratory</td>
<td>Ruzic, D</td>
</tr>
</tbody>
</table>

Restricted to Undergrad - Urbana-Champaign.

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<th>Instructor</th>
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<tbody>
<tr>
<td>43006</td>
<td>Lecture-Discussion</td>
<td>AEA</td>
<td>01:00 PM - 02:50 PM</td>
<td>R</td>
<td>106B8 - Engineering Hall</td>
<td>Ruzic, D</td>
</tr>
</tbody>
</table>

NPRE 429  **Plasma Engineering**  credit: 3 hours.
Basic principles and examples for adapting and applying the plasma state to solve a number of modern engineering problems. Plasma processing of materials for microelectronics and other uses, lighting, plasma displays, and other technologies. 3 undergraduate hours. 3 graduate hours. Prerequisite: ECE 329 or PHYS 435.
NPRE 431  Materials in Nuclear Engng  credit: 3 hours.
Development of a materials engineering background in the context of nuclear systems and radiation applications; relation of structure of materials to their physical and mechanical properties; development of phase formation and reaction kinetics from basic thermodynamics principles; charged particle interactions with surfaces; transport concepts of neutral and charged particles in matter; materials performance in nuclear and radiation applications, including radiation damage and effects. 3 undergraduate hours. 3 graduate hours.

CRN  Type  Section  Time  Days  Location  Instructor
30500  Lecture-Discussion  A  01:00 PM - 01:50 PM  MWF  335 - Mechanical Engineering Bldg  Heuser, B

NPRE 432  Nuclear Engng Materials Lab  credit: 2 hours.
Experiments relating to materials applications in nuclear engineering and energy systems. Examination of topics in room and elevated temperature mechanical properties of structural materials, corrosion, physical properties, radiation damage and effects, and materials selection in design. 2 undergraduate hours. 2 graduate hours. Prerequisite: Credit or concurrent registration in NPRE 431.

CRN  Type  Section  Time  Days  Location  Instructor
30504  Laboratory  AB1  01:00 PM - 02:50 PM  R  201 - Talbot Laboratory  Heuser, B
56075  Laboratory  AB2  04:00 PM - 05:50 PM  M  201 - Talbot Laboratory  Heuser, B

NPRE 435  Radiological Imaging  credit: 3 hours.
Physical, mathematical and experimental foundations of radiological imaging techniques, such as typical sources of ionizing radiation, the interactions of radiation with matter, image formation techniques, linear systems theory applied to radiological imaging, and the techniques for tomographic image reconstruction. Includes diagnostic radiological imaging modalities, such as X-ray computed tomography (CT), single photon computed emission tomography (SPECT), positron emission tomography (PET), as well as modern X-ray imaging techniques, such as phase contrast imaging and diffraction-enhanced X-ray imaging. Provides a solid foundation for understanding of modern radiological imaging techniques, and in-depth discussions on the strengths and limitations of various
modalities in application to medical, physical, security and environmental imaging. 3 undergraduate hours. 3 graduate hours. Prerequisite: NPRE 446.

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<tr>
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<tbody>
<tr>
<td>30510</td>
<td>Lecture-Discussion</td>
<td>F</td>
<td>02:00 PM - 02:50 PM</td>
<td>MWF</td>
<td>204 - Transportation Building</td>
<td>Meng, L</td>
</tr>
</tbody>
</table>

**NPRE 446  Radiation Interact w/Matter I  credit: 3 hours.**

Experimental and theoretical foundations of interaction of neutrons, photons, and charged particles with matter. Emphasis on topics that underlie the following applications: radiation detection, biological effects and radiation dosimetry, radiation damage and nuclear materials, neutron activation analysis, and fission and fusion energy systems. Classical theory of charged particle cross sections. Photon interactions with atomic electrons and nuclei. Radioactive-series decay. Computer assignments illustrate fundamental concepts. 3 undergraduate hours. 3 graduate hours. Credit is not given to NPRE majors for graduate hours. Prerequisite: MATH 285 and ME 300.

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<th>Location</th>
<th>Instructor</th>
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<tbody>
<tr>
<td>30513</td>
<td>Lecture</td>
<td>B</td>
<td>11:00 AM - 11:50 AM</td>
<td>MWF</td>
<td>101 - Transportation Building</td>
<td>Zhang, Y</td>
</tr>
</tbody>
</table>

**NPRE 448  Nuclear Syst Engrg & Design  credit: 4 hours.**

Engineering principles underling nuclear systems designed with emphasis on nuclear power reactors. Materials for nuclear systems. Energy generation and removal in single- and two-phase flows. Reactor and component control systems and nuclear fuel reloading patterns. 4 undergraduate hours. 4 graduate hours. Prerequisite: MATH 285, ME 300, and NPRE 455.

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<th>Instructor</th>
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<tbody>
<tr>
<td>30517</td>
<td>Lecture-Discussion</td>
<td>M</td>
<td>10:00 AM - 11:50 AM</td>
<td>TR</td>
<td>335 - Mechanical Engineering Bldg</td>
<td>Brooks, C</td>
</tr>
</tbody>
</table>

**NPRE 451  NPRE Laboratory  credit: 3 hours.**

Radiation detection and instrumentation; radiation dosimetry and shielding; basic measurements in nuclear engineering; engineering applications; micro computer data acquisition and experimental control. 3 undergraduate hours. 3 graduate hours. Prerequisite: NPRE 446.

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<tbody>
<tr>
<td>60320</td>
<td>Laboratory</td>
<td>AB3</td>
<td>12:30 PM - 04:20 PM</td>
<td>R</td>
<td>225 - Talbot Laboratory</td>
<td>Abbaszadeh, S</td>
</tr>
</tbody>
</table>

Restricted to students in the Nuclear, Plasma, & Rad Engr department. Lab meets in 225 Talbot.

<table>
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<tr>
<th>CRN</th>
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<tbody>
<tr>
<td>60318</td>
<td>Laboratory</td>
<td>AB6</td>
<td>05:00 PM - 08:50 PM</td>
<td>W</td>
<td>225 - Talbot Laboratory</td>
<td>Abbaszadeh, S</td>
</tr>
</tbody>
</table>

Restricted to students in the Nuclear, Plasma, & Rad Engr department.
Lab meets in 225 Talbot.

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<tr>
<th>CRN</th>
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<th>Days</th>
<th>Location</th>
<th>Instructor</th>
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<tbody>
<tr>
<td>60316</td>
<td>Lecture-Discussion</td>
<td>AE1</td>
<td>09:00 AM - 09:50 AM</td>
<td>MW</td>
<td>204 - Transportation Building</td>
<td>Abbaszadeh, S</td>
</tr>
</tbody>
</table>

Restricted to students in the Nuclear, Plasma, & Rad Engr department.

NPRE 457  **Safety Anlys Nucl Reactor Syst**  credit: 3 OR 4 hours.

Basic safety philosophy in nuclear reactor systems; brief review of nuclear reactor systems; regulatory processes; siting considerations; safety problems related to reactor dynamics; evaluation of postulated accidents; risks associated with nuclear fuel cycle; methods of systems safety analysis. 3 undergraduate hours. 3 or 4 graduate hours. Prerequisite: NPRE 402 or NPRE 247.

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<tbody>
<tr>
<td>34526</td>
<td>Lecture-Discussion</td>
<td>D</td>
<td>03:00 PM - 03:50 PM</td>
<td>MWF</td>
<td>100H - Talbot Laboratory</td>
<td>Ragheb, M</td>
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Credit Hours: 3 hours
Restricted to Undergrad - Urbana-Champaign.
Section restricted to undergraduates

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<th>Instructor</th>
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<tbody>
<tr>
<td>43010</td>
<td>Lecture-Discussion</td>
<td>D4</td>
<td>03:00 PM - 03:50 PM</td>
<td>MWF</td>
<td>100H - Talbot Laboratory</td>
<td>Ragheb, M</td>
</tr>
</tbody>
</table>

Credit Hours: 4 hours
Restricted to Graduate - Urbana-Champaign.
Section restricted to graduate students

NPRE 461  **Probabilistic Risk Assessment**  credit: 3 OR 4 hours.

Multidisciplinary theories and techniques of risk, safety, and reliability of complex systems and state-of-the-art Probabilistic Risk Assessment (PRA), which provides input for risk-informed decision-making for design, operation, and regulatory oversight in diverse high-consequence industries such as nuclear power, aviation, space, chemical processes, oil and gas, and healthcare. Topics include: Systematic Risk Scenario Modeling, Consequence Analysis, Bayesian Updating, Bayesian Belief Network, Binary Decision Diagram, Uncertainty Propagation, Hardware Reliability, Human Error Modeling, Failure Causal Modeling, Maintenance and Repair Modeling, Risk Importance Ranking, and Data Analytics. PRA and Reliability Engineering software codes will be utilized for assignments. 3 undergraduate hours. 4 graduate hours. Prerequisite: Junior, Senior or Graduate Standing in any Engineering Department.

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<tr>
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<th>Location</th>
<th>Instructor</th>
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<tbody>
<tr>
<td>69626</td>
<td>Lecture</td>
<td>PR1</td>
<td>12:30 PM - 01:50 PM</td>
<td>TR</td>
<td>100H - Talbot Laboratory</td>
<td>Mohaghegh, Z</td>
</tr>
</tbody>
</table>

Credit Hours: 3 hours
Restricted to Undergrad - Urbana-Champaign.
Multidisciplinary theories and techniques of risk, safety, and reliability of complex systems and state-of-the-art Probabilistic Risk Assessment (PRA), which provides input for risk-informed decision-making for design, operation, and regulatory oversight in diverse high-consequence industries such as nuclear power, aviation, space, chemical processes, oil and gas, and healthcare. Topics include: Systematic Risk Scenario Modeling, Consequence Analysis, Bayesian Updating, Bayesian Belief Network, Binary Decision Diagram, Uncertainty Propagation, Hardware Reliability, Human Error Modeling, Failure Causal Modeling, Maintenance and Repair Modeling, Risk Importance Ranking, and Data Analytics. PRA and Reliability Engineering software codes will be utilized for assignments.

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<th>Instructor</th>
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<tbody>
<tr>
<td>69627</td>
<td>Lecture</td>
<td>PR4</td>
<td>12:30 PM - 01:50 PM</td>
<td>TR</td>
<td>100H - Talbot Laboratory</td>
<td>Mohaghegh, Z</td>
</tr>
</tbody>
</table>

Credit Hours: 4 hours
Multidisciplinary theories and techniques of risk, safety, and reliability of complex systems and state-of-the-art Probabilistic Risk Assessment (PRA), which provides input for risk-informed decision-making for design, operation, and regulatory oversight in diverse high-consequence industries such as nuclear power, aviation, space, chemical processes, oil and gas, and healthcare. Topics include: Systematic Risk Scenario Modeling, Consequence Analysis, Bayesian Updating, Bayesian Belief Network, Binary Decision Diagram, Uncertainty Propagation, Hardware Reliability, Human Error Modeling, Failure Causal Modeling, Maintenance and Repair Modeling, Risk Importance Ranking, and Data Analytics. PRA and Reliability Engineering software codes will be utilized for assignments.

NPRE 481  Writing on Technol & Security  credit: 3 OR 4 hours.
Development of writing skills in standard computer, desktop publishing, and electronic publishing formats. On themes such as, global and regional security environments, arms control, nuclear energy, and climate change. For graduate credit, writing projects include documentation of computational work using software appropriate for typesetting of mathematical formulas. Same as GLBL 481. 3 undergraduate hours. 3 or 4 graduate hours. 4 graduate hours with consent of instructor.
This course satisfies the General Education Criteria for a: Advanced Composition

NPRE 483  Seminar on Security  credit: 1 hours.
Preparation of reports on a set of introductory lectures and student choices from various on-campus seminar series relevant to technology of domestic and international security and the regional and international contexts that influence the nature of security problems. Same as GLBL 483. 1 undergraduate hour. 1 graduate hour. May be repeated in separate terms to a maximum of 2 hours. Prerequisite: Composition I.

NPRE 498  Special Topics  credit: 1 to 4 hours.
Subject offerings of new and developing areas of knowledge in nuclear, plasma, and radiological engineering intended to augment the existing curriculum. See Class Schedule or departmental course information for topics and prerequisites. 1 to 4 undergraduate hours. 1 to 4 graduate hours. May be repeated in the same or separate terms if topics vary.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Type</th>
<th>Lecture Time</th>
<th>Instructor</th>
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</thead>
<tbody>
<tr>
<td>52349</td>
<td>Lecture-Discussion</td>
<td>C 12:00 PM - 01:50 PM</td>
<td>De Sanctis, M</td>
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<tr>
<td></td>
<td>Lecture-Discussion</td>
<td>C 04:00 PM - 05:50 PM</td>
<td></td>
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</table>

**Credit Hours:** 3 hours  
**Corrosion & Corrosion Control**  
Restricted to Undergrad - Urbana-Champaign.  
Meet 28-Aug-17 - 28-Sep-17.  
Provides an understanding of why and how corrosion occurs, the metallurgical and environmental factors, methods of corrosion control and failure prevention. Course entails 40 hours lecture and 10 hours lab.

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<th>Instructor</th>
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<tbody>
<tr>
<td>66520</td>
<td>Lecture</td>
<td>HDR 03:00 PM - 03:50 PM</td>
<td>Andruczyk, D</td>
</tr>
</tbody>
</table>

**Credit Hours:** 3 hours  
**Fusion Device Operations**  
Fusion Device Operations. Course covers issues relating to construction of a fusion reactor and running of fusion experiments.  
Cooling, magnetic, vacuum, electrical diagnostics, plasma facing components, control systems etc. will be elucidated. A torodial fusion device, HIDRA, will be a focus of the course where students will have the opportunity to get hands on experience building a fusion device. Class will include a one hour lecture/discussion and a three hour lab with time TBA. Prerequisites: Junior, Senior, or Graduate standing in College of Engineering; NPRE 421 or equivalent.

<table>
<thead>
<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>65018</td>
<td>Lecture</td>
<td>R 02:00 PM - 02:50 PM</td>
<td>Holm, R</td>
</tr>
</tbody>
</table>

**Credit Hours:** 2 hours  
**Nuclear Reactor Laboratory**  
Laboratory experiments relating to nuclear reactor physics and fission reactor operations, including: reactor instrumentation, flux and power measurements, start-up procedures, reactivity worth measurements, reactor period, control rod calibration experiments, and measurements in subcritical, critical and supercritical systems. This will be a reactor lab class based on webcast experiments/labs conducted at the Missouri University of Science and Technology research reactor. Prerequisites: NPRE 247.

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<tr>
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<th>Instructor</th>
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</thead>
<tbody>
<tr>
<td>65020</td>
<td>Laboratory</td>
<td>R2 12:30 PM - 03:20 PM</td>
<td>Holm, R</td>
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**Nuclear Reactor Laboratory**  
Lab component of NPRE 498 Section R Nuclear Reactor Laboratory. Enrollment requires registration in the Lecture section R. Prerequisites: NPRE 247.

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<tr>
<th>Course Code</th>
<th>Type</th>
<th>Lecture Time</th>
<th>Instructor</th>
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<tbody>
<tr>
<td>68373</td>
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<td>S1 03:00 PM - 03:50 PM</td>
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<tr>
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<td>Lecture</td>
<td>S1 03:00 PM - 04:40 PM</td>
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**Credit Hours:** 3 hours  
**Security Studies**  
Security Studies. Quantitative analysis of interactions between energy use and food production and the global balances of heat, greenhouse gases, and land ice and sea level, and information on the implications these interactions for use of non-fossil energy sources and the evolution of electric power grids. Those non-fossil energy sources include nuclear- and hydro-electric power generation. Also includes curating data sources and use of geographical information systems (GIS) to prepare for and present results of quantitative analyses.

**NPRE 501  Fundamentals of Nuclear Engrg**  
Credit: 4 hours.
Background for advanced work in nuclear engineering; problems in materials, heat transfer, and fluid flow; special emphasis on basic ideas and the mathematical similarity of problems in heat transfer, fluid flow, and neutron diffusion. Lecture-problem format. Prerequisite: NPRE 247; credit or concurrent registration in NPRE 446.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
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<tbody>
<tr>
<td>39440</td>
<td>Lecture-Discussion</td>
<td>A</td>
<td>10:00 AM - 11:50 AM</td>
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<td>Uddin, R</td>
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</table>

Restricted to Graduate - Urbana-Champaign.

NPRE 554  **Independent Lab Investigations**  credit: 1 TO 8 hours.
Individual experimental investigation in areas of nuclear, plasma, and radiological engineering. May be repeated. Prerequisite: Consent of instructor.

<table>
<thead>
<tr>
<th>CRN</th>
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<th>Section</th>
<th>Time</th>
<th>Days</th>
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</tr>
</tbody>
</table>

Departmental Approval Required
See Department Student Services for individual faculty section CRNs.

NPRE 595  **Student Research Seminar**  credit: 1 hours.
Seminar on current research and development activities in NPRE related fields, presented by students. 1 graduate hour. No professional credit. Approved for Letter and S/U grading. May be repeated in separate terms up to 2 hours.

<table>
<thead>
<tr>
<th>CRN</th>
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<td>Kozlowski, T</td>
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<td></td>
<td></td>
<td></td>
<td>Zhang, Y</td>
</tr>
</tbody>
</table>

Credit Hours: 1 hours

NPRE 596  **Seminar in Nuclear Sci & Engrg**  credit: 1 hours.
Lectures and discussions on current work in research and development in nuclear engineering and related fields by staff, advanced students, and visiting lecturers. Approved for S/U grading only. May be repeated.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
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<tr>
<td>30530</td>
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<td>114 - Transportation Building</td>
<td>Uddin, R</td>
</tr>
</tbody>
</table>

 Restricted to Graduate - Urbana-Champaign.

NPRE 597  **Independent Study**  credit: 1 TO 8 hours.
Individual study in areas of nuclear engineering and closely related fields not covered by regular course offerings. The work is carried out under the supervision of a member of the faculty. May be repeated. Prerequisite: Consent of instructor.
NPRE 598  **Special Topics**  credit: 2 TO 4 hours.
Subject offerings of new and developing areas of knowledge in nuclear, plasma, and radiological engineering intended to augment the existing curriculum. See Class Schedule or departmental course information for topics and prerequisites. May be repeated in the same or separate terms if topics vary.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
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Credit Hours: 4 hours
Corrosion & Corrosion Control
Restricted to Graduate - Urbana-Champaign.
Meets 28-Aug-17 - 28-Sep-17.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
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<th>Days</th>
<th>Location</th>
<th>Instructor</th>
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<tr>
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<td>206 - Transportation Building</td>
<td>Curreli, D</td>
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</table>

Credit Hours: 4 hours
Plasma Waves & Heating Tech
Restricted to Graduate - Urbana-Champaign.
The course will cover the fundamental physics of plasma waves and plasma heating, and the major technologies used in thermonuclear fusion reactors for plasma heating and current drive, including neutral beam injection, ion cyclotron heating, electron cyclotron, lower hybrid, electronic and ion Bernstein. Computational homework and projects.

<table>
<thead>
<tr>
<th>CRN</th>
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<th>Time</th>
<th>Days</th>
<th>Location</th>
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<td>Lecture</td>
<td>S4</td>
<td>03:00 PM - 04:40 PM</td>
<td>MW</td>
<td>1068 - Lincoln Hall</td>
<td>Singer, C</td>
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</tbody>
</table>

Credit Hours: 4 hours
Security Studies
Restricted to Graduate - Urbana-Champaign.
Security Studies. Quantitative analysis of interactions between energy use and food production and the global balances of heat, greenhouse gases, and land ice and sea level, and information on the implications these interactions for use of non-fossil energy sources and the evolution of electric power grids. Those non-fossil energy sources include nuclear- and hydro-electric power generation. Also includes curating data sources and use of geographical information systems (GIS) to prepare for and present results of quantitative analyses.

NPRE 599  **Thesis Research**  credit: 0 TO 16 hours.
Approved for S/U grading only. May be repeated.
<table>
<thead>
<tr>
<th>10080</th>
<th>Independent Study</th>
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<th>-</th>
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Departmental Approval Required  
See Department Student Services for individual faculty section CRNs.