| School of Nuclear Engineering | NUCL 200  
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Purdue University</td>
<td>Spring 2018</td>
</tr>
<tr>
<td>West Lafayette, IN  47907</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>INSTRUCTORS</th>
<th>Office</th>
<th>Phone</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allen Garner</td>
<td>NUCL 112A</td>
<td>49-40618</td>
<td><a href="mailto:algarner@purdue.edu">algarner@purdue.edu</a></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ONLINE COURSE INFO</th>
<th>BLACKBOARD: <a href="https://mycourses.purdue.edu/">https://mycourses.purdue.edu/</a></th>
</tr>
</thead>
</table>

| COURSE GOALS   |
|----------------|----------------------------------------------------------------------------------------------------------------------------------|
| 1.            | Learn concepts and vocabulary of nuclear engineering.                                                                           |
| 2.            | Learn basic approach to solving engineering problems.                                                                           |
| 3.            | Gain exposure to current uses, issues and events of nuclear fields.                                                            |
| 4.            | Solve typical radiation and nuclear reactor calculations.                                                                        |
| 5.            | Explain the fundamental concepts and principles of nuclear engineering.                                                         |
| 6.            | Realize the societal impact of nuclear engineering and the need for nuclear education, regardless of career field.            |

|------------|---------------------------------------------------------------------------------|

<table>
<thead>
<tr>
<th>COURSE HANDOUTS</th>
<th>Course materials can be obtained on BLACKBOARD. <strong>You are responsible for any and all course material posted on the website.</strong></th>
</tr>
</thead>
</table>

| HOMEWORK ASSIGNMENTS |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------|
| The homework assignments make up a significant portion of the overall course grade. These problems are assigned to give you experience and practice at the kinds of problems typical of this field and the sorts of calculations you will be expected to perform on an exam. The best way to earn a high grade in this course is to attend lecture and do your homework. Follow a logical, clearly understandable format for your homework assignments. **Engineering paper** is required. Write on only **one side** of the paper. If the grader cannot easily understand your work, you will lose points. Homework will be collected in class. Homework turned in later will be considered late. Late assignments will be docked **20% per day** and will not be accepted five days after the due date. |

<table>
<thead>
<tr>
<th>COURSE GRADING and WEIGHTING FACTORS</th>
<th>Homework and Quizzes</th>
<th>20%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Exam #1 (~31JAN)</td>
<td>20%</td>
</tr>
<tr>
<td></td>
<td>Exam #2 (~28 FEB)</td>
<td>20%</td>
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<tr>
<td></td>
<td>Exam #3 (~04 APR)</td>
<td>20%</td>
</tr>
<tr>
<td></td>
<td>Final (TBD)</td>
<td>20%</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>PURDUE and COURSE POLICIES IN CASE OF AN EMERGENCY</th>
</tr>
</thead>
<tbody>
<tr>
<td>In the event of a major campus emergency, course requirements, deadlines and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances beyond the instructor’s control. Changes in this course may be obtained by (a) Course web page (<a href="http://www.itap.purdue.edu/learning/tools/blackboard/index.cfm">http://www.itap.purdue.edu/learning/tools/blackboard/index.cfm</a>), Instructor's email (<a href="mailto:algarner@purdue.edu">algarner@purdue.edu</a>), or Instructor's phone (765.494.0618). It is recommended that students regularly visit the Purdue Emergency Preparedness website at <a href="http://www.purdue.edu/emergency_preparedness/">http://www.purdue.edu/emergency_preparedness/</a></td>
</tr>
</tbody>
</table>
Purdue honors pledge: “As a boilermaker pursuing academic excellence, I pledge to be honest and true in all that I do. Accountable together - we are Purdue.”
https://www.purdue.edu/provost/teachinglearning/honor-pledge.html

Academic integrity is one of the highest values that Purdue University holds. Individuals are encouraged to alert university officials to potential breeches of this value by either emailing integrity@purdue.edu or by calling 765-494-8778. While information may be submitted anonymously, the more information that is submitted provides the greatest opportunity for the university to investigate the concern.

PLAGIARISM

Plagiarism is defined in “Academic Integrity: A Guide for Students” (http://www.purdue.edu/studentsuccess/orientation/bgr/classroom/05-Wednesday%20Morning-Academic%20Integrity.pptm) as follows:
“Plagiarism is a special kind of academic dishonesty in which one person steals another person's ideas or words and falsely presents them as the plagiarist's own product. This is most likely to occur in the following ways:
- using the exact language of someone else without the use of quotation marks and without giving proper credit to the author
- presenting the sequence of ideas or arranging the material of someone else even though such is expressed in one’s own words, without giving appropriate acknowledgment
- submitting a document written by someone else but representing it as one’s own”

Any document that includes plagiarized materials will receive a grade of zero.

UNIVERSITY POLICY FOR DISHONESTY

Purdue prohibits "dishonesty in connection with any University activity. Cheating, plagiarism, or knowingly furnishing false information to the University are examples of dishonesty." [Part 5, Section III-B-2-a, University Regulations]
Furthermore, the University Senate has stipulated that "the commitment of acts of cheating, lying, and deceit in any of their diverse forms (such as the use of substitutes for taking examinations, the use of illegal cribs, plagiarism, and copying during examinations) is dishonest and must not be tolerated. Moreover, knowingly to aid and abet, directly or indirectly, other parties in committing dishonest acts is in itself dishonest." [University Senate Document 72-18, December 15, 1972]

UNIVERSITY POLICY ON VIOLENT BEHAVIOR

Purdue University is committed to providing a safe and secure campus environment for members of the university community. Purdue strives to create an educational environment for students and a work environment for employees that promote educational and career goals. Violent Behavior impedes such goals. Therefore, Violent Behavior is prohibited in or on any University Facility or while participating in any university activity. See http://www.purdue.edu/policies/facilities-safety/iva3.html.

COUNSELING & PSYCHOLOGICAL SERVICES (CAPS)

Purdue University is committed to advancing the mental health and well-being of its students. If you or someone you know is feeling overwhelmed, depressed, and/or in need of support, services are available. For help, such individuals should contact Counseling and Psychological Services (CAPS) at (765)494-6995 and http://www.purdue.edu/caps/ during and after hours, on weekends and holidays, or through its counselors physically located in the Purdue University Student Health Center (PUSH) during business hours.
UNIVERSITY POLICY ON ATTENDANCE

Students are expected to be present for every meeting of the classes in which they are enrolled. Only the instructor can excuse a student from a course requirement or responsibility. When conflicts or absences can be anticipated, such as for many University sponsored activities and religious observations, the student should inform the instructor as far in advance as possible. For unanticipated or emergency absences when advance notification to an instructor is not possible, the student should contact the instructor (or TAs) as soon as possible by email, or by contacting the main office that offers the course. When the student is unable to directly contact the instructor and is unable to leave word with the instructor’s department because of circumstances beyond the student’s control, and in cases of bereavement, the student or the student’s representative should contact the Office of the Dean of Students.

GRIEF ABSENCE POLICY FOR STUDENTS

Purdue University recognizes that a time of bereavement is very difficult for a student. The University therefore provides the following rights to students facing the loss of a family member through the Grief Absence Policy for Students (GAPS). GAPS Policy: Students will be excused for funeral leave and given the opportunity to earn equivalent credit and to demonstrate evidence of meeting the learning outcomes for missed assignments or assessments in the event of the death of a member of the student’s family. See the University’s website for additional information: http://www.purdue.edu/studentregulations/regulations_procedures/classes.html

STUDENTS WITH DISABILITIES

Purdue University is committed to maintaining an inclusive community that recognizes and values the inherent worth and dignity of every person; fosters tolerance, sensitivity, understanding and mutual respect among its members; and encourages each individual to strive to reach his or her own potential. In pursuit of its goal of academic excellence, Purdue University seeks to develop and nurture its diversity. The University believes that diversity among its many members strengthens the institution, stimulates creativity, promotes the exchange of ideas and enriches campus life.

Purdue University views, evaluates and treats all persons in any university-related activity or circumstance in which they may be involved solely as individuals on the basis of their own personal abilities, qualifications and other relevant characteristics.

Purdue University does not condone and will not tolerate Discrimination against any individual on the basis of race, religion, color, sex, age, national origin or ancestry, genetic information, disability, status as a veteran, marital status, parental status, sexual orientation, gender identity or gender expression. Purdue University promulgates policies and programs to ensure that all persons have equal access to its employment opportunities and educational programs, services and activities. The principal objective of this policy is to provide fair and consistent treatment for all students and employees of the University. Purdue is committed to increasing the recruitment, selection and promotion of faculty and staff at the University who are racial or ethnic minorities, women, persons with disabilities and veterans. The University also is committed to policies and programs that increase the diversity of the student body.
<table>
<thead>
<tr>
<th><strong>Nondiscrimination</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Purdue University is committed to maintaining a community which recognizes and values the inherent worth and dignity of every person; fosters tolerance, sensitivity, understanding, and mutual respect among its members; and encourages each individual to strive to reach his or her own potential. In pursuit of its goal of academic excellence, the University seeks to develop and nurture diversity. The University believes that diversity among its many members strengthens the institution, stimulates creativity, promotes the exchange of ideas, and enriches campus life.</td>
</tr>
<tr>
<td>Purdue University prohibits discrimination against any member of the University community on the basis of race, religion, color, sex, age, national origin or ancestry, genetic information, marital status, parental status, sexual orientation, gender identity and expression, disability, or status as a veteran. The University will conduct its programs, services and activities consistent with applicable federal, state and local laws, regulations and orders and in conformance with the procedures and limitations as set forth in Executive Memorandum No. D-1, which provides specific contractual rights and remedies. Any student who believes they have been discriminated against may visit <a href="http://www.purdue.edu/report-hate">www.purdue.edu/report-hate</a> to submit a complaint to the Office of Institutional Equity. Information may be reported anonymously.</td>
</tr>
<tr>
<td>You may find Purdue's nondiscrimination statement: <a href="http://www.purdue.edu/purdue/ea_eou_statement.html">http://www.purdue.edu/purdue/ea_eou_statement.html</a></td>
</tr>
</tbody>
</table>
EMERGENCY PREPAREDNESS SYLLABUS ATTACHMENT

EMERGENCY NOTIFICATION PROCEDURES are based on a simple concept – if you hear a fire alarm inside, proceed outside. If you hear a siren outside, proceed inside.

- **Indoor Fire Alarms** mean to stop class or research and immediately evacuate the building.
  - Proceed to your Emergency Assembly Area away from building doors. Remain outside until police, fire, or other emergency response personnel provide additional guidance or tell you it is safe to leave.
- **All Hazards Outdoor Emergency Warning Sirens** mean to immediately seek shelter (Shelter in Place) in a safe location within the closest building.
  - “Shelter in place” means seeking immediate shelter inside a building or University residence. This course of action may need to be taken during a tornado, a civil disturbance including a shooting or release of hazardous materials in the outside air. Once safely inside, find out more details about the emergency*. Remain in place until police, fire, or other emergency response personnel provide additional guidance or tell you it is safe to leave.

*In both cases, you should seek additional clarifying information by all means possible...Purdue Emergency Status page, text message, Twitter, Desktop Alert, Albertus Beacon, digital signs, email alert, TV, radio, etc. review the Purdue Emergency Warning Notification System multi-communication layers at [http://www.purdue.edu/ehps/emergency_preparedness/warning-system.html](http://www.purdue.edu/ehps/emergency_preparedness/warning-system.html)

EMERGENCY RESPONSE PROCEDURES:

- Review the Building Emergency Plan (available on the Emergency Preparedness website or from the building deputy) for:
  - evacuation routes, exit points, and emergency assembly area
  - when and how to evacuate the building.
  - shelter in place procedures and locations
  - additional building specific procedures and requirements.

EMERGENCY PREPAREDNESS AWARENESS VIDEOS

- "The Coming Storm" The Coming Storm is a movie that dramatizes the aftermath of a campus shooting, weaving within the story the best practices and lessons learned from active shooter incidents that have occurred throughout the United States. View FBI Short Movie [here](http://www.purdue.edu/ehps/emergency_preparedness/warning-system.html).
- "Run. Hide. Fight.®" YouTube Video Produced by the City of Houston Mayor’s Office of Public Safety and Homeland Security through a grant provided by a Department of Homeland Security Grant Funded Project of the Regional Catastrophic Planning Initiative, provides critical options for consideration to survive an active shooter event.
- Department of Homeland Security Active Shooter web site...resources and tips on how to prepare for this type of horrific incident...learn more
- Ready: Whenever, Wherever—A public service campaign, from the Indiana Department of Homeland Security, which encourages Hoosiers to practice reasonable awareness and develop a plan for action in the event of an emergency

MORE INFORMATION
Reference the Emergency Preparedness web site for additional information: [https://www.purdue.edu/ehps/emergency_preparedness/](https://www.purdue.edu/ehps/emergency_preparedness/)
Evacuation/Emergency Assembly Area (EAA) Location (after you have evacuated your building)

- **Primary location (should be outside, in an area away from the building):**

  EMERGENCY ASSEMBLY AREAS

  - **Primary location:** EAA #1
  - **Secondary location (should be inside a nearby building in case of inclement weather):** Purdue Memorial Union (PMU).
OVERVIEW OF TOPICS COVERED

Atomic Structure, Atomic Weight
Mass & Energy, Relativity, Wavelengths
Excited States, Nuclear Decay
Radioactivity Calculations
Nuclear Reactions
Mass Defect, Binding Energy
Properties of Matter
Photon Interactions with Matter
Photon Interactions with Matter
Charged Particle Interactions
Cross Sections, Reaction Rates
Neutron Attenuation
Neutron Reactions, Compound Nucleus
Neutron Scattering, Energy Loss
Fission
Fission Products
Fission Neutrons (Prompt vs. Delayed)
Nuclear Power Systems, k
Nuclear Power Systems, Reactor Systems
Fuel Enrichment Process
Neutron Flux, Fick's Law
Equation of Continuity, Diffusion Equation
Infinite Planar Source, Solutions to Diffusion Equation
Point Source, Bare Slab
Diffusion Groups, Diffusion Length, Thermal Diffusion
Multiple Group Neutron Moderation
One Group Reactor Equation
Slab Reactor
Buckling, Other Reactor Shapes
One Group Critical Equation
Four Factor Formula, Criticality Calculations
Applications
Applications, Reflector Savings
Heterogeneous Reactors
Reactor Kinetics
Reactor Kinetics
Reactor Control, Temperature Effects, Poisoning
Other Reactor Applications
Reactor Accidents
Fusion
Survey of energy
Nuclear security
Medicine and Agricultural applications of radiation
Health physics and biological effects of radiation
Basic reactor operation