

## Standardized Syllabus for the College of Engineering

### ENU 4800 Introduction to Nuclear Reactor Materials

1. Catalog Description (3 Credits) –Introduction to the materials used in nuclear energy systems and their response to the reactor environment. The majority of materials related issues encountered in the nuclear power plants are discussed in this course.
2. Pre-requisites and Co-requisites –None
3. Course Objectives: to provide the students with a comprehensive knowledge on the types of materials used in nuclear reactors, their response to the reactor environments and most of the materials problems encountered in the operation of nuclear power reactors for energy production.
4. Contribution of course to meeting the professional component:  
This course provides 3 credits towards Engineering Sciences.  
Does this course contain design experience? Yes, a small amount.
5. Relationship of course to program outcomes:  
Ability to apply knowledge of mathematics, science, and engineering to identify and solve materials problem in nuclear reactor systems  
Ability to engage in life-long learning and to conduct research using external sources;
6. Instructor: Assistant Professor Yong Yang
  - a. 176 Rhines Hall
  - b. 352-8463791
  - c. [yongyang@ufl.edu](mailto:yongyang@ufl.edu)
  - d. <http://www.mse.ufl.edu/yong-yang.html>
  - e. Walk-in or appointments by email
7. Teaching Assistant: No
8. Meeting Times: Three Times every week.
9. Class/laboratory schedule:  
M W F: 6
10. Meeting Location: NSC227
11. Material and Supply Fees: None
12. Textbooks and Software Required: None  
The course notes will be provided through Canvas.

### 13. Recommended Reading (see 12 above):

Fundamentals of Radiation Materials Science, Gary Was  
Fundamental aspects of nuclear reactor fuel elements, Donald R. Olander  
Nuclear Reactor Materials and Applications by B. Ma

### 14. Course Outline:

#### **Overview:**

- 1. Course Introduction
- 2. Materials in Nuclear Reactor

#### **Basis of Materials:**

- 3. Crystal structures
- 4. Point defects in solids

- 5. Diffusion
- 6. Dislocation and grain boundary

**Radiation damage:**

- 7. Collision theory, Cross sections, Energy loss
- 8. SRIM, Range, Damage
- 9. Ion, Neutron damage
- 10. Microstructural development

**Fuel:**

- 11. Chemistry, fabrication, failure
- 12. Fission products
- 13. Swelling

**Mechanical performance:**

- 14. Creep
- 15. Hardening
- 16. Toughness

**Corrosion:**

- 17. Thermodynamics
- 18. Kinetics
- 19 Corrosion in nuclear fuel

15. Conduct, Attendance and Expectations:

Proper behavior in class is required, eating, texting, chatting, or other activities that are not part of the class are not allowed. Students who do not comply with these requirements or who behave disorderly or disrespectfully may be asked to leave the classroom. Cell phones and other electronic devices must be completely silence or turned off. Attendance is strongly recommended for this course, and you'll fall behind quickly if you skip lecture, and excessive absence may affect your final grades indirectly.

16. Grading – methods of evaluation:

Three In Class Exams: 20% each  
 Homework: 4 assignments, 40% total  
 No final exam.

17. Grading Scale: 100-96= A; 95-91 = A-; 90-86 = B+; 85-81 = B; 80-76= B-; 75-71 = C+; 70-66 = C; 67-65 = C-; 64-62 = D+; 61-59 = D; 58-56 = D-; Less than 56 = E. Grades may be curved up at the end of the course at the discretion of the instructor.

“A C- will not be a qualifying grade for critical tracking courses. In order to graduate, students must have an overall GPA and an upper-division GPA of 2.0 or better (C or better). Note: a C- average is equivalent to a GPA of 1.67, and therefore, it does not satisfy this graduation requirement. For more information on grades and grading policies, please visit:

<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx> ”

18. Make-up Exam Policy: make-up exams are only given for exceptional circumstances and in accordance with University policy, and the request need to be pre-approved by

the lecturer. Other work are consistent with university policies that can be found at: <https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>

19. Honesty Policy – UF students are bound by The Honor Pledge which states, “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: “On my honor, I have neither given nor received unauthorized aid in doing this assignment.” The Honor Code (<http://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

Note that failure to comply with this commitment will result in disciplinary action compliant with the UF Student Honor Code Procedures.

See <http://www.dso.ufl.edu/sccr/procedures/honorcode.php>

20. Accommodation for Students with Disabilities – Students Requesting classroom accommodation must first register with the Dean of Students Office. That office will provide the student with documentation that he/she must provide to the course instructor when requesting accommodation.
21. UF Counseling Services –Resources are available on-campus for students having personal problems or lacking clear career and academic goals. The resources include:
- UF Counseling & Wellness Center, 3190 Radio Rd, 392-1575, <http://www.counseling.ufl.edu/cwc/Default.aspx>, counseling services and mental health services.
  - Career Resource Center, Reitz Union, 392-1601, career and job search services.
- University Police Department 392-1111
22. Software Use – All faculty, staff and student of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.
23. Students are expected to provide feedback on the quality of instruction in this course based on 10 criteria. These evaluations are conducted online at <https://evaluations.ufl.edu>. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at <https://evaluations.ufl.edu/results>.