

## Standardized Syllabus for the College of Engineering

### Nuclear Fuels

1. Catalog Description (3 Credits) –Survey of the nuclear fuels from ore to waste, including mining, design, fabrication, in-core performance, storage, disposal and fuel economics.  
ENU 6937/Section 1C44
2. Pre-requisites and Co-requisites –None
3. Course Objectives: to provide the students with an in-depth knowledge of the technical aspects of various stage of the nuclear fuel cycle with an emphasis on materials behavior, structural and thermal analysis.
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: N/A
8. Meeting Times: three times every week.
9. Class/laboratory schedule:  
M, W and F 3, 50 minutes
10. Meeting Location: MAEB229
11. Material and Supply Fees: None
12. Textbooks and Software Required: None  
The course notes will be provided through Sakai.
13. Recommended Reading (see 12 above):  
*Fundamental aspects of nuclear reactor fuel elements, Donald R. Olander*

*Nuclear Fuel Cycle: Analysis and Management, R. G. Cochran and N. Tsoulfanidis*  
*Nuclear Fuel Management, H. W. Graves, JR.*

14. Course Outline:

**Overview:**

- 1. Course Introduction
- 2. Overview on fuel performance

**Fuel Resources**

- 3. Mining, milling, conversion and enrichment

**Fuel types, design and fabrication**

- 4 Reactor fuels, fission yields and fuel chemistry
- 5. Claddings (zircaloy, advanced steel cladding, ceramic hybrid cladding, accident tolerant, etc..)
- 6. Fuel assemblies, fuel cladding interactions

**In-core fuel performance and management**

- 6. Loading, burn-up and refuel
- 7. Densification, swelling and creep
- 8. Thermal analysis
- 9. Fuel Failures
- 10. LOCA (accident tolerant fuel)
- 11. FRAPCON code for fuel performance evaluation

**Reprocessing and recycling, storage and disposal**

- 12. Reprocessing
- 13. Water pool and dry storage
- 14. Geologic repository disposal

**Fuel economics**

- 15. Cost evaluation

15. Attendance and Expectations: Attendance in lectures does not count in the course grade. However, all students are expected to attend class, and you'll fall behind quickly if you skip lectures. Cell phones and other electronic devices must be completely silence class. Activities that are not part of the class are not allowed during class time.

16. Grading – methods of evaluation:

- 30% midterm project
- 30% on presentation (30 minutes)
- 40% on final report

Absence from presentation without pre-approval by the lecturer will result in automatic failure in the course. The final presentation will be on the Dec 3<sup>rd</sup>, and the report is due by Dec 10<sup>th</sup>.

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.

Graduate students need an overall GPA of 3.00 truncated and a 3.00 truncated GPA in their major (and in the minor, if a minor is declared) at graduation.” For more information on grades and grading policies, please visit:

<http://gradcatalog.ufl.edu/content.php?catoid=4&navoid=907#grades>

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 or 9-1-1 for emergencies.

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>. “