

Changes to this syllabus will be provided via the ELearning/Sakai platform. Such changes may include those required by policy changes, instructor travel, changes in the speed of course coverage, university closure, errors in previous syllabus versions, and other reasons.

1. Description:

Continuation of ENU 4191. Nuclear reactor theory and engineering as applied to design synthesis of reactors. Nuclear, material, thermo-fluid and/or mechanical design considerations of nuclear reactors with particular emphasis on design characteristics. Analytical methods and application of computer codes for design analysis and evaluation. Individual and/or group design involving integration of reactor neutronics, dynamics and control, thermal hydraulics, transient analysis and safety, power production, instrumentation, control, radiation shielding and protection, fuel cycle, fuel behavior and/or cost.

2. Prerequisite:

ENU 4134, ENU 4191 with a minimum grade of C, ENU 4612, and ENU 4630. Coreq: ENU 4641.

3. Program Educational Objectives Supported by Course

1. Graduates will have successful careers in Nuclear Engineering or related disciplines.
2. Graduates will pursue advanced degrees or continuing education.

4. Professional Components Supported by Course

1. Provide students with the ability to apply advanced mathematics, computational skills, science and engineering science, including atomic and nuclear physics, to identify, formulate, analyze, and solve nuclear and radiological engineering problems.

4. Provide students with the skills needed to communicate effectively, work collaboratively, and understand their professional and ethical responsibilities and the impact of engineering solutions in a societal and economic context so they can pursue successful, productive careers in nuclear and radiological engineering.

5. Program Outcomes Supported by Course

Outcome a: an ability to apply knowledge of mathematics, science, and engineering.

Outcome c: an ability to design a system, component or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.

Outcome d: an ability to function on multi-disciplinary skills teams.

Outcome e: an ability to identify, formulate, and solve engineering problems.

Outcome f: an understanding of professional, ethical and regulatory responsibility in engineering practice.

Outcome g: an ability to communicate effectively, using both oral and written presentations, in engineering practice

Outcome h: The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.

Outcome i: a recognition of the need for life-long learning and the ability to adapt this to engineering practice;

Outcome j: a knowledge of contemporary issues as they relate to professional engineering practice

Outcome k: an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

Outcome l: an ability to apply advanced mathematics, science, and engineering sciences, including atomic and nuclear physics, to nuclear and radiological systems and processes

Outcome n: an ability to work professionally in on or more of the areas of: nuclear power systems, nuclear instrumentation and measurement, radiation protection and shielding, and radiation sources and applications

6. Instructor

DuWayne Schubring, Assistant Professor

205 Nuclear Sciences Building

352-392-0852

dlschubring@ufl.edu

Web: Sakai

Office hours: MWF 1230-1330 (walk-in), MF 1500-1630 (reserved: Group A, 1500-1530; Group B, 1530-1600; Group C, 1600-1630), by e-mail, and appointment.

Beginning and end times of office hours will be enforced strictly. There is no open door policy.

7. Teaching Assistant:

none

8/9/10. Course Meetings:

NSB 225, W 1500-1800 (“Periods” 8, 9, and 10). Final Exam: April 25, 1230-1430 (the final report is a “take-home final”, which I will collect in NSB 225 at 1430).

11. Material and Supply Fees:

None

12. Text (Required):

None

13. References

Useful references for ENU 419x include, but are not limited to:

1. FE Reference Handbook from NCEES:
<http://ncees.org/exams/study-materials/download-fe-supplied-reference-handbook/>
2. Handbook of Nuclear Reactors Calculations, Vol. I, Ed. Y. Ronen, CRC Press, 1986.
3. A Guide to Nuclear Power Technology, F.J. Rahn, et al., J. Wiley & Sons, 1984.
4. Structural Materials in Nuclear Power Systems, J.T.A. Roberts, Plenum Press, 1981.
5. Principles of Design Improvement for Light Water Reactors, L.S. Tong, Hemisphere Publishing, 1988.
6. Thermal Design of Nuclear Reactors, R.H.S. Winterton, Pergamon Press, 1981.
7. Nuclear Power Plant Design Analysis, Alexander Sesonske, NTIS TID 26241, 1973.
8. Nuclear Reactor Analysis, J.J. Duderstadt & L.J. Hamilton, J. Wiley & Sons, 1976.
9. Nuclear Systems I & II, N.E. Todreas & M.S. Kazimi, HPC, 1990.
10. Heat Transfer and Fluid Flow in Nuclear Systems, Henri Fenech, Pergamon Press Inc, 1981, ISBN 0-08-027 181-2.
11. Nuclear Power Plant Engineering, James H. Rust, Haralson Publishing Company, 1979, ISBN 0-934534-00-4.
12. Nuclear Heat Transport, M.M. El-Wakil, Intl Textbook Co (and ANS), 1971, ISBN 0-7002-2309-6.
13. Nuclear Power Plant's FSARs
14. Nuclear Fuel Cycle: Analysis and Management, Robert Cochran and N. Tsoufanadis, 1993.
15. Nuclear Power Reactor Instrumentation Systems Handbook, Vol. I & II, J. M. Harrer and G.Beckerely, USAEC, 1973.
16. PE Review Manual
17. Nuclear Reactor Kinetics, 2nd Edition, M.S. Ash, 1979.
18. Radiation Detection and Measurement, 2nd Edition, G. F. Knoll, 1979.
19. Radiation Shielding, J. K. Shultis and R. E. Faw, 2000.
20. Nuclear Reactor Theory, Bell and Glasstone, VanNostrand Reinhold Company, New York, 1970.

+ any other textbooks you've accumulated along the way.

14. Course Outline

Presentations: First group 1500-1600; Second group, 1600-1700; Third group, 1700-1800

Informal Discussion

- No other activities: First group 1500-1600; Second group, 1600-1700; Third group, 1700-1800
- All-class sessions (topic as indicated): All-class session 1500-1545, First group 1545-1630, Second group, 1630-1715; Third group, 1715-1800

Beginning with the informal discussion on February 3, assume "no other activities" will be held unless otherwise announced by 2359 on the preceding Monday.

Week	Day	Date	Material
1	W	6 Jan	Syllabus, Informal Discussion (A,B,C)
2	W	13 Jan	Economics (1/1), Informal Discussion (A,B,C)
3	W	20 Jan	Economics (2/2), Informal Discussion (A,B,C)
4	W	27 Jan	Monthly Report Presentation 1 (A,B,C)
5	W	3 Feb	Informal Discussion (A,B,C)
6	W	10 Feb	Informal Discussion (A,B,C)
7	W	17 Feb	Informal Discussion (A,B,C)
8	W	24 Feb	Monthly Report Presentation 2 (A,B,C)
9	W	2 Mar	NO CLASS (UF HOLIDAY)
10	W	9 Mar	Informal Discussion (A,B,C)
11	W	16 Mar	Informal Discussion (A,B,C)
12	W	23 Mar	Monthly Report Presentation 3 (A,B,C)
13	W	30 Mar	Informal Discussion (A,B,C)
14	W	6 Apr	Informal Discussion (A,B,C)
15	W	13 Apr	Informal Discussion (A,B,C)
16	W	20 Apr	Draft Final Report Presentation (A,B,C)

15. Attendance and Expectations

By this point in your college career, it is assumed that you have developed communication and team skills, assimilated a large volume of technical information, and begun to develop engineering judgment. As a capstone course, ENU 4192 will test the degree to which you have achieved these goals. It is a *sink or swim* experience – if you complete this course, you’ll likely get your degree and be allowed to do engineering out in the real world. Passing grades will not be granted to those unable to do so safely and effectively.

This course is meant as a transition to employment from the typical ENU course. Throughout your college experience (and before), instructors expended considerable effort to organize the material for your rapid consumption, but in ENU 4192 *you will not be led step-by-step* through the design project. It is *your job* to formulate design questions, *your job* to break them into manageable chunks, *your job* to acquire and use the tools needed to do the analysis, and *your job* to communicate the results and/or ask for assistance when necessary.

Interaction with Instructor, Other Faculty, Group Members, Other Groups

Please review the instructor’s office hours, above. *There is no open door policy for this course.* Barring genuinely exceptionally circumstances, appointments are not available on Tuesday. (A group falling behind and wanting a “bail-out” just before a deadline does not qualify.)

A list of other faculty, their areas of expertise, and office hours will be made available on the course website. Please note that all faculty have significant other responsibilities and most frequently travel. Further, with the exclusion of the lead instructor, assisting ENU 4192 students is not a particularly high priority for the faculty, who must focus on their own teaching, research, chasing money, mentoring graduate students, committee work, etc. before helping you all on this course.

In short: poor planning on your part does not constitute an emergency on our part.

Each group will be provided a location to upload files and have discussions on Sakai. You should not adopt some other collaboration environment, as the instructor will not have access (and does not want another website to check, besides). Your individual level of activity on this site will be considered for grade adjustments.

The following collaborations between groups are allowed, though not required:

- Sending links to files/resources or the resources themselves, provided they were written by someone not in the course. For example, you may send web links, PDFs, online calculation tools, etc.
- Assisting one another with debugging code input files.

The following collaborations between groups are not allowed:

- Exchange of any files, including code input files, code output files, calculation files, reports (including in PDF format), and homework that you prepared yourself.
- Providing information known to be wrong (or any other form of sabotage).

Attendance, Class Conduct, Late Work

Attendance is required at all-class meetings and at informal discussions and will be taken, starting January 13. You will receive no credit for the informal discussion, in-class homework, or presentation you miss during an unexcused absence. Further, your final grade will be directly penalized, as shown in Item 16/17.

There is no tolerance for mobile phones or other electronic disruptions. Such disruptions will lead to the student being told to leave the room for the duration of the class period *and penalized for being absent*. During office hours or appointments: if your phone rings, you will be told to leave the room for the duration of that day's office hours (or your appointment considered over).

Absences and late-work excuses can be grouped into the categories of *professional*, *medical*, and *personal*.

Professional: Reasonable excuses/extensions for job/internship interviews, technical conferences, or other professional/career development reasons should be requested. Requests are typically granted, at instructor's discretion, unless they would grant a student or group of students an unfair advantage over their peers, cause significant disruption to the course or grading schedule, or violate some UF policy. Whenever possible, schedule your professional commitments for the dates of informal discussions rather than presentations. Absences on April 20 (final presentations) would only be approved for exceptionally meritorious reasons.

Medical: Excuses/extensions will also be granted for (your own) medical reasons – please do not come to class if you are ill. Per UF policy, in the case of medical absences that are frequent or suspiciously-timed (*e.g.*; you are repeatedly, suddenly ill at deadlines), the instructor may request a signed note from a physician or similar professional practitioner.

Personal: In addition, UF policies require accommodation for several non-academic, non-medical reasons. *Excuses/extensions for these personal issues are strictly limited to those mandated by the letter of UF policies.* UF-authorized excuses/extensions include UAA competitions, religious observances, and serious illness or death of specified relatives. There is no single document listing all UF-approved personal reasons for excuses/extensions; further, the list of reasons changes from

time to time. If you have a question regarding your personal issue and if it qualifies under one of the excuses/extensions policies, contact the instructor in advance.

Note that a group extension is only available if 3 members of your group or 2 members of your group that are the lead and (only) associate engineer in some technical area have an excuse for an extension. If just 1 member of your group has an interview, gets ill, has a religious holiday, etc., the remainder of the group must turn in the report on time. Further, be advised that any approved absence does not reduce the amount of work you are expected to complete, but merely rearranges the timing. For those issues that are predictable (interview, holidays, etc.), you should work ahead to avoid disruption. To mitigate the issues with unexpected absences (illness, etc.), *keep your associate engineers up to date with your activities in your lead technical areas.*

Homework

Homework will be collected at the beginning of the class period at which it is due, except in-class homework that is due at the end of the 45-minute class period. All homework assignments will require submission of hard copy. No type of paper or writing utensil is preferred over others (within reason). You must include your full first and last name on all homework (as well as reports). The allowable level of collaboration on homework assignments may vary throughout the course and is indicated clearly on each assignment.

Direct electronic submission of files used on homework (spreadsheets, etc.) may be required for some assignments, as indicated on the assignment sheet. The electronic components of homework submissions *must* be in the formats requested. If you do not know how to convert your files to these formats, contact the instructor in advance of the deadline. Not knowing your software is not an excuse for late homework. Acceptable formats may include plain text, .pdf, .csv, and EES files, as well as other file formats at the instructor's discretion.

In particular, the instructor will not open files from students in the following formats: .ppt, .pptx, .doc, .docx. Presentation and word processing documents are best converted to .pdf.

The instructor will open spreadsheets in .csv, .xls, or .xlsx format. Please be aware that .xlsx format has remaining compatibility issues with free office software; .xls is usually a wiser choice.

Informal Discussions

The instructor will evaluate your performance at informal discussions. These are individual grades, though they will likely be highly correlated to those of your group members. The grades will be assigned based on your preparation for the meeting (being ready to discuss progress, having visuals if needed), with an emphasis on completion of "action items" from the previous meeting. *Note: the informal discussion grades are not intended to evaluate the quality of your design work and may not strongly correlate with report grades.*

Monthly and Final Reports

You will receive formal assignments for each of these, a minimum of two weeks before the due date, including grade information and expected milestones by technical area. Each report will include both group and individual grades. A peer review system is in place to assure equitable workload. In the event the workload is not equitable, the instructor reserves the right to adjust individual grades to accurately reflect contributions to the work.

You must write your reports in either Microsoft Word or L^AT_EX and turn in each report in *three different ways*:

1. Electronically, on Sakai (not e-mail), as a single .pdf,
2. Electronically, on Sakai (not e-mail), as .doc, .docx, or .zip (a single-file approach is not required), and
3. As a paper-clipped or placed-in-folder (no staples) hard copy.

The second of these means that at least one of your group members will need to be capable of saving files as .pdf and of combining .pdf files. The exact due dates and times are included on each formal assignment.

Certain professional document and figure standards will be enforced on the project; *the onus is on you to figure out how to meet these standards in whatever programs you use to write the document and make figures*. Your instructor has exactly zero sympathy for those who select a word processor without knowing how to format their text using it – complaints that the standards are not the same as a particular piece of software’s defaults will fall on deaf ears.

Each year, ANS has a design competition to which only one group per university may submit. The selection criteria for this group will be based entirely on the final group report scores and specified on that assignment, with additional weight (relative to course grade) on novelty and integration of post-Generation II technologies. Runner(s)-up will be invited if their work is also of respectable quality and the first-place group declines the invitation.

Feedback

You will receive feedback live at all of the above meetings and in written form for everything you turn in. It is vital that you respond to feedback by improving your work *promptly*. Do not wait for the grade to come in before responding to the live feedback in the presentation and any early written feedback. Generally, you should have made progress by the next week’s informal discussion. Issues brought up in one presentation that are not addressed by the next will lead to *major* reductions in your group technical quality score and in the individual evaluation of the members responsible for that area.

Consider: if you were working in a real reactor vendor design group, would your supervisor tolerate a 3-4 week turnaround time for response?

Late Work

Late written reports lose and homework lose one-third of their value if turned in before Friday at 1500 and have no value thereafter. No late presentations are allowed (zero credit).

Grade Appeal

All appeals of grades, including those from clerical/grade-calculation errors, must be made within 1 week of return. (This may be modified for specific assignments. I will announce this via e-mail if needed.)

Grade appeals must be provided in the following format:

- Include your entire assignment *unmodified*.

- Attach (paper clip preferred) a written summary of which problem(s) or part(s) you believe were graded inaccurately. Be as specific as possible.
- Turn in your appeal to me at class time or during office hours.
- I will review your grade appeal, contact you via your ufl.edu e-mail address, and return the assignment in class. Fairly simple appeals provided to me during office hours may be decided upon while you wait, at my discretion.

Appeals will be considered for clerical errors, addition errors, and inconsistent scoring. Grade appeals will not be entertained if you simply do not like that (for example) Part 1 was worth only 2 points with Part 2 worth 5.

Denied appeals may be deemed “frivolous”, if the instructor believes the student is not acting in a good faith belief that more points are deserved. Following two frivolous appeals, your grade appeal privilege through this method will be *revoked*. Further appeals must be done through the petitions process, which requires formal paperwork and department/program level involvement.

E-mail

The primary means of communication with the class outside of class time will be e-mail listserv. These listserv will send to your @ufl.edu address only. Any inquiries regarding grading will be directed towards your @ufl.edu address only, per FERPA .

Technical and procedural questions will be answered as a reply to whatever e-mail address you used to send them. If the entire class will benefit from the answer, I may send to the class list (either in lieu of or in addition to a direct reply to you, at my discretion). If you do not wish to have a specific e-mail to me regarding technical content or course procedures replied to through the class list, you must explicitly state this in that e-mail. In such a case, I will reply directly to you and send a general-purpose announcement to the class list, not indicating who caused me to send it.

Letters of Recommendation/Evaluation Policy

To request a letter of recommendation/evaluation (for graduate school or otherwise), you must provide:

- A hard copy of your UF transcript.
- A hard copy of a résumé (or CV).
- A hard copy of the following form: <http://www.registrar.ufl.edu/pdf/ferparelease.pdf>. You *must* check all four circles.

Letters are typically filed once per week. For students whom I know only through coursework, my letter typically focuses on an estimate of their rank-in-class and on their performance on projects and challenging problems.

I will only file *one batch* of letters per student during the term, for any student currently enrolled in a class with me. (This policy is designed to keep me from looking up slight changes in your rank/performance multiple times for multiple batches of letters.) I recommend that this batch occur as late as possible in the term to allow me sufficient information (sample size) on your performance to write a useful letter.

16/17. Grading

Points (total: 1500) are allocated as follows:

- 100 - homework assignments, including self-evaluations
- 200 - informal discussion performance (top 8)
- 100 - individual score, Monthly Report 1
- 100 - group score, Monthly Report 1
- 150 - individual score, Monthly Report 2
- 150 - group score, Monthly Report 2
- 100 - individual score, Monthly Report 3
- 100 - group score, Monthly Report 3
- 250 - individual score, Final Report
- 250 - group score, Final Report

If:

- Your group score on the Final Report is 166 points or fewer (less than two-thirds of possible),
or
- Your individual report scores (total, out of 600) is 399 points or fewer (less than two-thirds of possible)

... you will receive a grade of E in the class.

Else, your grade is computed as a percentage of the 1500 total points, less the unexcused absence deduction. This deduction will be 0% for 0 or 1 unexcused absences, 1% for 2, 2% for 3, 4% for 4, 8% for 5, 16% for 6, 32% for 7, and 64% for 8 or more. Only one absence per day will be counted. (The last of these mathematically clinches a failing grade for you in the course.) Then, final grades will be assigned based on:

- A: > 86%
- A-: 84-85.99%
- B+: 82-83.99%
- B: 75-81.99%
- C: 67-74.99%
- E: < 67%

The “Gradebook 2” feature is used on Sakai to enable you to look up grades quickly. Note that this gradebook is *not* official. The instructor reserves the right to correct errors, including transcription errors, from the official (spreadsheet) gradebook, to which he alone has access, until finalization of grades with the registrar. This includes implementation of the unexcused absence penalty and the two “instant fail” rules, which are not directly supported in Sakai.

The instructor reserves the right to grant higher grades at the end of the course at his sole discretion, including the use of B-, and C+. Under no circumstances will grades of C- or any flavor of D be used. Regardless, the following statement is required by COE policy: “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:

<http://www.registrar.ufl.edu/catalog/policies/regulationgrades.html>”

18. Make-up Exam Policy

No exams means no make-up exams. Make-up work is covered in Item 15.

19. Honesty Policy

All students admitted to the University of Florida have signed a statement of academic honesty committing themselves to be honest in all academic work and understanding that failure to comply with this commitment will result in disciplinary action. This statement is a reminder to uphold your obligation as a UF student and to be honest in all work submitted and exams taken in this course and all others.

Addendum to 19: Violations of UF Academic Honesty policies in this course will be reported through appropriate channels. If you choose to commit academic misconduct in this course, expect to receive a failing grade for the course.

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, psychological and psychiatric services.
- Career Resource Center, Reitz Union, 392-1601, career and job search services.

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. Course Evaluations

The University of Florida expects students 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>