

Elements of Nuclear and Radiological Engineering Design
ENU 4191, Section 6299, Fall 2017
McCarty Hall B, 2102 (except as indicated in course schedule, page 4)
M 1605-1800 (UF “Periods” 9-10), F 1605-1655 (UF “Period” 9). No final.

Instructor

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Office hours: M 1400-1445, T 1315-1445, W 1400-1445, F 1230-1445, and by appointment.

Description

The first of a two-course capstone design sequence. A one-hour lecture that provides preparatory work for ENU 4192. Identification of initial design project(s) and areas of work, selection/assignment of groups to areas of work/tasks, accumulation of reference materials and computer codes and development of initial timelines/milestones.

Prerequisites

ENU 4144. Co-reqs: ENU 4134, ENU 4612, and ENU 4630.

Professional Components (ABET)

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

Program Outcomes (ABET)

While ENU 4191 indirectly supports many outcomes (all except for b and m), no outcome assessments occur in this course.

Text (None Required)

None

References

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

1. Handbook of Nuclear Reactors Calculations, Vol. I, Ed. Y. Ronen, CRC Press, 1986.
2. A Guide to Nuclear Power Technology, F.J. Rahn, et al., J. Wiley & Sons, 1984.
3. Structural Materials in Nuclear Power Systems, J.T.A. Roberts, Plenum Press, 1981.
4. Principles of Design Improvement for Light Water Reactors, L.S. Tong, Hemisphere Publishing, 1988.

5. Thermal Design of Nuclear Reactors, R.H.S. Winterton, Pergamon Press, 1981.
6. Nuclear Power Plant Design Analysis, Alexander Sesonske, NTIS TID 26241, 1973.
7. Nuclear Reactor Analysis, J.J. Duderstadt & L.J. Hamilton, J. Wiley & Sons, 1976.
8. Nuclear Systems I & II, N.E. Todreas & M.S. Kazimi.
9. Heat Transfer and Fluid Flow in Nuclear Systems, Henri Fenech, Pergamon Press Inc, 1981, ISBN 0-08-027 181-2.
10. Nuclear Power Plant Engineering, James H. Rust, Haralson Publishing Company, 1979, ISBN 0-934534-00-4.
11. Nuclear Heat Transport, M.M. El-Wakil, Intl Textbook Co (and ANS), 1971, ISBN 0-7002-2309-6.
12. Nuclear Power Plant's FSARs
13. Nuclear Fuel Cycle: Analysis and Management, Robert Cochran and N. Tsoulfanadis, 1993.
14. Nuclear Power Reactor Instrumentation Systems Handbook, Vol. I & II, J. M. Harrer and G.Beckerely, USAEC, 1973.
15. FE & PE Review Manual
16. Nuclear Reactor Kinetics, 2nd Edition, M.S. Ash, 1979.
17. Radiation Detection and Measurement, 2nd Edition, G. F. Knoll, 1979.
18. Radiation Shielding, J. K. Shultis and R. E. Faw, 2000.
19. Nuclear Reactor Theory, Bell and Glasstone, VanNostrand Reinhold Company, New York, 1970.

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

Course Outline and Schedule

ENU 4192 will involve design of a nuclear fission reactor system, to be completed in groups. The purpose of ENU 4191 is to prepare you for ENU 4192. This includes the following broad foci for ENU 4191:

1. Development of engineering design skills, including work in teams
2. Exploration of the full range of reactor technology options, including non-LWR choices
3. Development of familiarity with nuclear engineering codes, with a focus on code selection (training in operation of the codes *is not* part of ENU 4191) and acquisition of legal copies of the codes
4. Reinforcement and backfilling of selected technical content (standards and codes, engineering economy) that does not fit comfortably within other required courses

The course will cover the following material, with approximate number of lecture periods noted:

1. Introduction to Course (1)
2. Technical Communication (1)
3. All Things "Codes": Standards and Codes for Reactor Design, Available Computer Codes; Code Selection (1)
4. Engineering Design Process (5)
5. Project Description/Assignment and Localization Issues (2)
6. Introduction to Technology Options (other than large LWRs) (5)
7. Practical Advice for Core Design (2) – an optional evening lecture

8. Engineering Economy (2-3)
9. Project Discussions and Presentations (5)

The course work will consist of two major, equally-weighted components:

1. A total of 9 assignments, equally-weighted, will be required. These may include individual and group work and may include in-class activities. In addition to assignments tied to the topics above, you will also be required to attempt to obtain relevant codes from RSICC. *Failure to fill out the appropriate paperwork is grounds for failure in the course, regardless of performance on other course items.*
2. A group report selecting a general reactor design for detailed work in ENU 4192, including a presentation and a written report (both last day of class).

A draft schedule follows. Those Mondays noted with * are expected to be significantly longer than one hour sessions

Week	Day	Date	Due	Material
1	M	21 Aug		Introduction to Course
1	F	25 Aug		NO CLASS
2	M	28 Aug		Technical Communication
2	F	1 Sep		NO CLASS
3	M	4 Sep		NO CLASS (UF HOLIDAY)
3	F	9 Sep		NO CLASS
4	M	11 Sep		All Things “Codes”
4	R	14 Sep		Guest Lecture (Rampal) - Practical Core Design (Optional)
4	F	15 Sep		Guest Lecture (Rampal) - Small Modular Reactors
5	M	18 Sep	HW1-2	Engineering Design Process
5	F	22 Sep		TBD (likely cancellation)
6	M*	25 Sep	HW3-4	Engineering Design Process (in class: HW4)
6	F	29 Sep		NO CLASS
7	M*	2 Oct	HW5	Engineering Design Process (in class: HW5)
7	F	6 Oct		NO CLASS (UF HOLIDAY)
8	M*	9 Oct		Introduction to Reactor Types, PHWR, SCWR
8	F	13 Oct		NO CLASS
9	M*	16 Oct		Introduction to Reactor Types – Fast Spectrum Reactors
9	F	20 Oct		Introduction to Reactor Types – HTGR
10	M	23 Oct	HW6	Project Description/Assignment & Quiz on Reactor Types (in class: HW6)
10	F	27 Oct		NO CLASS
11	M	30 Oct		NO CLASS (ANS)
11	F	3 Nov		TBD (likely cancellation)

Week	Day	Date	Due	Material
12	M*	6 Nov	HW7-8	RHINES 157 First Project Discussions (in class: HW8)
12	F	10 Nov		NO CLASS (UF HOLIDAY)
13	M	13 Nov		Professionalism in Engineering (tentative)
13	F	17 Nov		Location-Specific Issues for ENU 419x Project
14	M*	20 Nov	HW9	RHINES 157 Second Project Discussions (in class: HW9)
14	F	24 Nov		NO CLASS (UF HOLIDAY)
15	M*	27 Nov		Engineering Economy
15	F	1 Dec		TBD (likely cancellation)
16	M*	4 Dec	Project	RHINES 157 Project Presentations

Attendance, Class Expectations, Make-Up Policy, etc.

Attendance & Class Conduct

Skip at your peril. Attendance is not directly considered in the grade. However, HW 4-6 and 8-9 will be done during class time – you will receive a zero for an homework completed during an unexcused absence. In the case of excused absences: HW 4-5 would be excluded from the calculation of your homework average (there is no reasonable way to make these up); a make-up HW 6 would be arranged; and the revised grade calculation for HW 8-9 is provided on those assignments.

If a student arrives late or leaves early, he/she is expected to do so with minimum level of disruption to the class in progress. 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, *including the class period containing in-class quiz*. The same principle applies to office hours or appointments – if you stop by my office and 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).

I reserve the right to take attendance to prioritize e-mail assistance.

Make-Up Work Policies

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

Professional: Reasonable extensions for job/internship interviews, technical conferences, or other professional/career development reasons should be requested. Requests are typically granted, at my 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.

Medical: 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), I 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. *Extensions for these personal issues are strictly limited to those mandated by the letter of UF policies.* The list of UF-approved personal reasons changes from time to time. If you have a question regarding your personal issue and if it qualifies under one of the excused absence/late-work policies, contact me in advance.

The 12-day rule will be enforced strictly. Note that the count of days is based on a per-student, not per-approved-activity basis. All requests for excused absence or extension must be submitted in writing, preferably via e-mail.

Pursuant to HWCOE policy, the following statement is required: Excused absences are consistent with university policies in the undergraduate catalog

<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>
and require appropriate documentation.

For the purposes of this course, in the above-referenced list of approved absence reasons, the word “family” shall be taken to mean your parents, grandparents, great-grandparents (etc.); children, grandchildren (etc.); siblings; aunts/uncles; nieces/nephews; your spouse and the spouse of any of the above; and half- or step- “versions” of the above categories. More distant relatives (cousins, etc.), partners (excluding spouses), and pets are not included. Minor illnesses (guideline: anything meriting home care only or care at a walk-in clinic, as opposed to an ER) of family members, including minor children, do not count as serious family emergencies, nor do events such as birthdays, anniversaries, weddings, etc.

Political activities, including protests, demonstrations, and the like are considered personal matters and not generally permitted as excused absences. This includes activities related to nuclear engineering or nuclear power. Exceptions: (1) A student who is pursuing nuclear-related (whether pro- or anti-) politics as a career path may be granted excused absences, at my discretion, on condition of providing evidence of *bona fide* efforts to secure a full-time position or to secure admission to a relevant, non-STEM degree-granting graduate program and (2) activities between October 27 and November 3, inclusive, that are connected to the ANS Conference will be taken as related to that professional activity and permitted as excused absences.

Further, be advised that any approved reasons for late work do 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. In the case where your approved make-up work adversely affects a group project, I may modify the assignment and/or groups for those concerned to minimize the disruption of one student’s issues on other group members.

Homework

Excluding the make-up work policies, above, no late homework or projects will be accepted.

Homework and projects (including mini-projects) may be submitted electronically (via Canvas) or as hard copy; some may have required electronic submissions indicated on the assignment sheets. The following restrictions apply for electronic submissions:

- Submissions may include multiple files, but only files with the following extensions will be accepted: pdf, xls, xlsx, ees, txt, and (for the Project only) zip. This zip archive may not contain any ppt, pptx, doc, or docx files. Such files will be *ignored* for the purposes of grading.
- If a hard copy and electronic submission are provided, the hard copy will take precedence. (Only it will be read, reviewed, and graded.)
- If (for a group homework or project), multiple students independently submit electronically, the submission by the student whose name is listed first on the assignment that I post to Canvas will take precedence.

The allowable level of collaboration on homework assignments may vary throughout the course and is indicated clearly on each assignment.

See the sub-heading “Attendance & Class Conduct”, above, for how in-class homework is handled for absences (excused and unexcused).

Projects

Electronic submission of the final project is accepted, based on the same rules as for homework (above). You will need to collaborate with and divide labor among the members of your team, but no collaboration among teams is permitted. I will assign the groups. A peer review system is in place to assure equitable workload. In the event the workload is not equitable, I reserve the right to adjust individual grades to accurately reflect contributions to the work.

No late projects are accepted. (In other words, missing the project deadline will cause your whole group to fail the class.)

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*. I have 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.

Collaboration

The project will be done in groups. I will assign the groups. A peer review system is in place to assure equitable workload. In the event the workload is not equitable, I reserve the right to adjust individual grades to accurately reflect contributions to the work.

The ground rules for collaboration should be decided by each group through compromise and consensus. However, regardless of the preferences of the group as a whole, each student retains the individual right to privacy and to maintain good mental and physical health. To this end, no student shall be compelled:

- To join a real-name social networking site or modify their existing use of such a site, or
- To accept a 24/7 or other onerous on-call policy.

That is: each member holds a unilateral veto on using Facebook (or some such) for your group’s work or for being contacted at all hours of the day and night.

Inter-personal issues within your group stemming from deciding group rules must be brought to me *promptly* for arbitration. This arbitration will focus on the guidelines above and in forming an equitable compromise (essentially, equal marginal/new inconvenience) among group members and not on determining whose activities outside this course (including personal pursuits, situations, and choices) are more meritorious.

No collaboration is permitted between teams on projects. The allowed level of collaboration on homework may vary and is specified on the assignment.

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 near the end of the term. I will announce this via e-mail as 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.

On very rare occasions, if I believe the student is not acting in a good faith belief that more points are deserved, I will deem the appeal frivolous. 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.

File Formats

The electronic components of assignment submissions *must* be in the formats requested. If you do not know how to convert your files to these formats, contact me in advance of the deadline. Not knowing your software is not an excuse for late assignments. Accepted formats may include plain text, .pdf, .csv, and EES files, as well as other file formats at my discretion.

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

Electronic Communication and Course Website

The primary means of communication with the class outside of class time will be e-mail listserv. These listservs 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.

The primary use of the Canvas website is for file storage, as all assignments, lecture notes, etc. will be provided there. I take no responsibility for downtime of this service, nor for actions of University of Florida staff that affect the website (including Canvas upgrades). The gradebook on Canvas is used to enable you to look up grades quickly. Note that this gradebook is *not* official. I reserve the right to correct errors, including transcription errors, from the official (spreadsheet) gradebook, to which I alone have access, until finalization of grades with the registrar.

Deadline Flexibility

I am well-aware that senior students have extremely busy fall semesters. Reasonable accommodations on homework and projects will be made for professional commitments (conference attendance, taking the GRE, grad school visits, etc.) and, potentially, to minimize conflicts among senior year courses. However, I do not have an efficient means to make myself aware of all student conflicts and commitments. Therefore, it is up to you to make me aware of issues, for which some accommodations/extensions/flexibility *may* be offered.

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.

I reserve the right to refuse provide a letter for any student and am not obligated to provide a reason for such refusal.

Grading

If:

- You fail to fill out the paperwork to request codes from RSICC, or
- Receive a grade of strictly lower than 65% on your final project (presentation component and written component combined)

... you will receive a grade of E in the class (since you are not prepared for ENU 4192, which is the whole point of ENU 4191.) Note that these “insta-fail” rules will not be directly shown in the unofficial, for-your-convenience-only Canvas gradebook.

Else, your grade is computed as the average of your homework average (as a percentage) and your final project score (as a percentage). Final grades will be assigned based on:

- A: $\geq 86\%$
- A-: 84.5-85.99%
- B+: 83-84.49%
- B: 75-82.99%

- C: 67-74.99%
- E: < 67%

I reserve the right to grant higher grades at the end of the course at my sole discretion, including the use of A-, B+, B-, and C+. Under no circumstances will grades of C- or any flavor of D be used.

More information on UF grading policy may be found at:

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

Students Requiring Accommodations

Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, <https://www.dso.ufl.edu/drc>) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to me when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

Please note that UF policy, clarified to faculty during the Fall 2016 term, states that no retroactive accommodations are available.

Course Evaluations

UF expects students to provide feedback on the quality of instruction in this course by completing online evaluations at <https://evaluations.ufl.edu/evals>. 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/>.

University 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:

<https://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.

Software Use

All faculty, staff, and students 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.

Student Privacy

There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see:

<http://registrar.ufl.edu/catalog0910/policies/regulationferpa.html>

Campus Resources

Health and Wellness

U Matter, We Care: If you or a friend is in distress, please contact umatter@ufl.edu or 352-392-1575 so that a team member can reach out to the student.

Counseling and Wellness Center (392-1575) and

<http://www.counseling.ufl.edu/cwc>

University Police Department: 392-1111 or 9-1-1 for emergencies.

Sexual Assault Recovery Services (SARS)

Student Health Care Center, 392-1161.

University Police Department at 392-1111 (or 9-1-1 for emergencies), or <http://www.police.ufl.edu/>

Academic Resources

E-learning technical support, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu

<https://lss.at.ufl.edu/help.shtml>

Career Resource Center, Reitz Union, 392-1601. Career assistance and counseling.

<https://www.crc.ufl.edu/>

Library Support, Various ways to receive assistance with respect to using the libraries or finding resources.

<http://cms.uflib.ufl.edu/ask>

Teaching Center, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring.

<https://teachingcenter.ufl.edu/>

Writing Studio, 302 Tigert Hall, 846-1138. Help brainstorming, formatting, and writing papers.

<https://writing.ufl.edu/writing-studio/>

Student Complaints Campus:

https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf

On-Line Students Complaints:

<http://www.distance.ufl.edu/student-complaint-process>

Changes to Syllabus

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