Instructor

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dlschubring@ufl.edu (This is the best way to reach me. The Canvas “conversations” feature is not e-mail. Messages sent via that system will not be acknowledged.)

Office hours: There is no open door policy. T 1500-1600, W 1230-1430, R (time TBD), F 1400-1600, and by appointment. Beginning and end times of office hours will be enforced strictly.

Course 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.

Prerequisites

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

Course Objectives

This Senior Capstone course will train students in a large team-based project (design of a fission reactor, type and country selected in ENU 4191), including all technical areas within the NE undergraduate program. Written and oral communication through four reports will be emphasized, along with weekly progress updates through informal discussions.

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.

Student Outcomes Supported by Course

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. n/a
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies

Textbook

None

Reference Materials

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

13. Nuclear Power Plant’s FSARs

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

Course Schedule

Details of each week’s timing are subject to change until 1615 on the preceding Tuesday. Do not make conflicting plans with any time in the 1500-1800 block on Wednesdays.

- January 9
  Syllabus (1500-1545), HPC Resources (1545-1635), Engineering Economy (1635-1800)
- January 16
  Group A Informal Discussion (1500-1550), Engineering Economy (1600-1650), Group B Informal Discussion (1700-1750)
- January 23
  Group A Informal Discussion (1500-1550), Engineering Economy (1600-1650), Group B Informal Discussion (1700-1750)
- January 30
  Group A Presentation (1500-1610), Group B Presentation (1620-1730)
- February 6
  Group A Informal Discussion (1500-1600), Group B Informal Discussion (1610-1710)
- February 13
  Group A Informal Discussion (1500-1620), Group B Informal Discussion (1630-1750)
- February 20
  Group A Informal Discussion (1500-1600), Group B Informal Discussion (1610-1710)
- February 27
  Group A Presentation (1500-1610), Group B Presentation (1620-1730)
- March 6
  No Meeting (spring break)
- March 13
  Group A Informal Discussion (1500-1600), Group B Informal Discussion (1610-1710)
- March 20
  Group A Informal Discussion (1500-1600), Group B Informal Discussion (1610-1710)
• March 27
  Group A Presentation (1500-1610), Group B Presentation (1620-1730) [In the event that Report 2 presentations are particularly strong, this presentation may be dropped at the discretion of the instructor in favor of other professionally-relevant activities.]
• April 3
  Group A Informal Discussion (1500-1600), Group B Informal Discussion (1610-1710)
• April 10
  Group A Informal Discussion (1500-1620), Group B Informal Discussion (1630-1750)
• April 17
  Group A Informal Discussion (1500-1610), Course Evaluations (1610-1630), Group B Informal Discussion (1630-1740)
• April 24
  Group A Presentation (1500-1625), Group B Presentation (1635-1800)

**Evaluation of Grades**

**Grading Items**

- 400 – Informal discussions (10, 40 points each)
- 150 – Report 1
- 300 – Report 2
- 150 – Report 3
- 500 – Report 4

Excluding cases in which informal discussions are missed, this means that there are 1500 equally-valuable points in the course. Each score – all 4 reports and all 10 informal discussions – will be independently rounded to a whole number of points. Report scores include the corresponding presentation (excluding the case in which Presentation 3 is cancelled).

**Grading Scale**

Any student earning 324 or fewer points on Report 4 will automatically fail the course, regardless of grades on other items. Otherwise, final grades will be assigned based on percentages as follows:

- A: 85%+
- A-: 84-84.99%
- B+: 83-83.99%
- B: 75-81.99%
- C: 67-74.99%
- E: < 67%

I reserve the right to grant higher grades at the end of the course at my sole discretion and to round assignment grades to full points. Under no circumstances will grades of C- or any flavor of D be used (they are insufficient for the major, besides).
Grading of Informal Discussions

I will evaluate your performance at informal discussions. These are individual grades, though they will likely be 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.

The informal discussion grades are not intended to evaluate the quality of your design work as much as your consistent process. Therefore, informal discussion grades tend to not strongly correlate with report grades. Since 85% will earn a grade of A in this course, a score of 35/40 represents an effective “checking off boxes” effort and scores of 36 or higher are reserved for demonstration of unusual initiative.

In the event that one or more informal discussions are cancelled or you are excused from one or more informal discussions, the only available accommodation is to exclude the score(s). If all 10 are held and you miss none, each is worth 2.67%. If, for example, one is cancelled due to my (unexpected) travel and you miss another one due to illness or a religious holiday, each of the remaining 8 are worth 3.33% for you.

At the end of the semester, your lowest score (if lower than 20) on an informal discussion will be replaced by a score of 20/40. This “Mercy Rule” is in place to avoid an excessive deleterious effect on your grade from a single poor performance or unexcused absence. (Given that a score of 35 is to be considered a good score, this score of 20 effectively “caps” the reduction at 15 points or 1% of the course total.) Over the past years, this rule has primarily benefitted students who miss a course for personal reasons not within those allowed by UF rules – see the attendance policy below.

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 I believe 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.
Miscellaneous Grading Notes

In this course, 85% is necessary and sufficient to earn an A. A score of 90% is a praise-worthy achievement that can be interpreted as “fully meets expectations”. A score of 95% represents genuine excellence. A 100% can be interpreted as “the instructor can hardly imagine a student doing a better job” – on average, there are fewer than half a dozen perfect scores earned among all informal discussions for all students and all line-item grades in all reports.

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.

More information on UF grading policy may be found at:
https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx

Attendance and Late Work

Attendance is required at informal discussions and will be taken, starting January 16. Requests to miss presentations will only be granted if mandated by UF policy or in genuinely exceptional circumstances. I reserve the right to require a make-up presentation in a form I choose or to base your grade on the written report (or the written report and slides) only, at my discretion.

Absences and 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, violate some UF policy, or involve missing presentations for avoidable reasons.

**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 policies, contact me in advance.

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. Exception: 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 securing a full-time position or to secure admission to a relevant, non-STEM degree-granting graduate program.

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.

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.

Other Course-Specific Policies

Interaction with Instructor, Other Faculty

Please review my office hours on the first page. There is no open door policy for this course. Barring genuinely exceptional circumstances, appointments are not available over the weekend or on Mondays.

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.
Recording Lectures, etc.

UF grants each student the right to record classes for which they enroll, on the condition that no disruptions are presented to other students or faculty. For the purposes of ENU 4192, this includes any activities during the 1500-1800 block on Wednesdays.

You are not required to inform me that you are recording these class sessions. Failures of your recording equipment are not my problem – requests to delay the meeting or to repeat myself for the convenience of your recording will not be honored.

Further, you are permitted to record office hour or appointment conversation on ENU 4192 questions. If you wish to record office hours or appointments, you must inform (not ask) me that you will be recording. In this case, note that our conversation must be restricted to the content of this course. If you wish to ask more general questions, such as those relating to academic planning or your future career goals, I will insist that you turn the recording off before I discuss those subjects.

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.

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, and reports (including in PDF format) that you prepared yourself.
- Providing information known to be wrong or any other form of sabotage.
Class Conduct

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).

Computers, Printers, Software

A research computing (HiPerGator) allocation of 32 cores will be made available for MCNP in this course. This is a shared resource between both groups. No drama will be tolerated regarding the distribution of this resource between the groups. In the event of such drama, I will request that the allocation be revoked.

ENU 4192 is often quite taxing on student computers, particularly for those that are nearing end-of-life status, as befits many students’ final undergraduate semesters. It is important that you develop a plan for how to move forward if your computer fails and requires either replacement or a long repair time. While I will help mediate issues within your group, there are no program-level resources available to help with personal computer issues. Similarly, you need to have a robust plan for printing the lengthy report documents and copies of the slides, as extensions are not available if your personal printer fails or if some UF-owned printing resource fails (or even if both happen).

I will not open e-mailed files from students in the following formats: .ppt, .pptx, .doc, .docx. Presentation and word processing documents are best converted to .pdf. I will open spreadsheets in .csv, .xls, or .xlsx format.

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).

Reports

You will receive formal assignments for each of these, including detailed grading and logistical information. For Reports 1-3, progress milestones for all future reports are included, in draft form. The assignments will be finalized a minimum of one week before the due date for Reports 1 and 3 and two weeks before the due date for Reports 2 and 4.

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.

You must write your reports in either Microsoft Word or \LaTeX and turn in each report in three different ways:

1. Electronically, via Canvas, as a single .pdf. This means that at least one of your group members will need to be capable of saving files as .pdf and of combining .pdf files.
2. Electronically, via Canvas, as a .zip archive containing editable versions of all files that you consider part of the report. (This does not need to include all code input and output files.) A single-file approach is not required. Before selecting any cloud-based collaborative environment, make sure that it is compatible with this requirement. This .zip archive must also include a .pdf (one slide per page) of your slides.
The .pdf, above, may be included as part of the .zip archive (that is, you can fulfill both requirements with a single file upload). In the event that your files do not properly upload to Canvas due to excessive file size, you may also submit both electronic versions via USB drive. Note that you should not expect to receive the USB drive until the following informal discussion.

3. As a single-sided hard copy, placed in a two-pocket portfolio folder or paper-clipped (no staples or other bindings).

For the electronic submissions, if 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.

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. The same principle applies to “upgrades” to your writing environment that break formatting.

Feedback

You will receive feedback live at all informal discussions and presentations and in written form for reports. 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. You should have already 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 grade.

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

Two Key Success Strategies

1. Particularly in the first 6-8 weeks of the course, focus on the longest sequential process in the course – selection of core materials (excluding enrichment/fissile fraction and/or burnable poison), geometric design of core, basic thermal analysis (in-core), determination of enrichment and burnable poison, detailed thermal analysis (in-core) including coupling to reactor physics, [optimization/iteration, if needed], heat exchanger design, power cycle design, detailed economic analysis. No more than 2 of your group members should be focused on other areas, like instrumentation and controls or shielding, at this time.

2. Be clear what your time frame is when asking me questions such as, “Is this enough work on instrumentation/economics/licensing?” I answer these questions as presented, which has often been in the present tense, leading to student frustration when time passes and their stagnated work falls back below expectations. A level of work that is adequate (for example) for the informal discussion on February 13 may not meet the requirements for Report 2 and will be woefully short for Report 3.
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).

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 to provide a letter for any student and am not obligated to provide a reason for such refusal.

Syllabus Boilerplate

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](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.

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](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:
On-Line Students Complaints:
http://www.distance.ufl.edu/student-complaint-process