

Elements of Nuclear and Radiological Engineering Design

ENU 4191, Section 6299, Fall 2019

MAE B 238

M 1605-1800 (UF “Periods” 9-10) and F 1605-1655 (UF “Period” 9), No final.

Instructor

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dlschubring@ufl.edu (This is the best way to reach me. The Canvas “conversations” feature *is not* e-mail and does not send a message to me until I happen to log into Canvas. Therefore, messages sent via that system will not be acknowledged.)

Office hours: M 1400-1445, T 1315-1445, W 1230-1445, F 1400-1445, and by appointment. Beginning and end times of office hours will be enforced strictly. There is no open door policy.

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.

Course Objectives

This Senior Capstone course sequence will train students in a large team-based project, including multiple technical areas within the NE undergraduate program. Written and oral communication will be emphasized.

For most students, ENU 4192 will involve design of a nuclear fission reactor system, to be completed in groups. One group of 3-5 will be assigned an alternate project related to experimental design for the TREAT reactor, in collaboration with several other NE faculty as well as the Idaho National Laboratory. 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. 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
3. Reinforcement and backfilling of selected technical content (standards and codes, engineering economy) that does not fit comfortably within other required courses
4. For reactor design groups: exploration of the full range of reactor technology options, including non-LWR choices

Program Outcomes (ABET)

1. n/a
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 (high coverage)
3. an ability to communicate effectively with a range of audiences (high coverage)
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 (low coverage)
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 (medium coverage)
6. n/a
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies (high coverage)

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

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

1. A total of 7 assignments, equally-weighted, will be required. These will include both individual and group work and will include in-class activities.
 - (a) Engineering Design Constraints, Standards and Codes, Regulations
 - (b) In-class Activity Related to Engineering Design
 - (c) In-class Activity Related to Engineering Design
 - (d) Survey to Assign Project Groups
 - (e) Group Division of Labor Form
 - (f) In-class Activity Related to Design Project
 - (g) In-class Activity Related to Design Project
2. A group report selecting a general reactor design for detailed work in ENU 4192, including a presentation and a written report.

Week	Day	Date	Due	Material
1	F	23 Aug		Introduction to Course
2	M	26 Aug		Technical Communication
3	M	2 Sep		NO CLASS (UF HOLIDAY)
4	M	9 Sep		Computer Codes, Standards and Codes, & Engineering Design Process (1/3)
5	M	16 Sep	HW 1-2	Engineering Design Process (2/3)
6	M	23 Sep	HW 3	Engineering Design Process (3/3)
7	M	30 Sep		TREAT Project Pitch and Non-LWR Options (1/3)
8	M	7 Oct	HW 4	Non-LWR Options (2/3)
9	M	14 Oct		Assignment of Project Groups & Non-LWR Options (3/3)
10	M	21 Oct	HW 5-6	First Project Discussions
11	M	28 Oct		Catch-up (if needed)
12	M	4 Nov	HW 7	Second Project Discussions
13	M	11 Nov		NO CLASS (UF HOLIDAY)
14	M	18 Nov		NO CLASS (ANS Meeting)
15	M	25 Nov	Project	Project Presentations
16	M	2 Dec		Engineering Economy

Most Monday sessions will last somewhat longer than 1 hour. In the event of delays in coverage, additional Friday sessions may be added at the official, registrar-provided time (1605-1655, UF “Period” 9) in our regular classroom.

Grading

If you 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.)

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: 87%+
- A-: 85-86.99%
- B+: 83-84.99%
- B: 75-82.99%
- C: 66-74.99%
- E: < 66%

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.

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>

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.

Course-Specific Policies

Attendance

Skip at your peril. Attendance is not directly considered in the grade. 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.

However, several homeworks will be done during class time – you will receive a zero for a homework completed during an unexcused absence. Accommodations, which may take the form of simply dropping that HW for you, will be made for excused absences. Further, some materials in the course will not be covered in the textbook or in the notes provided online – only in class. Some example problems and complex figures (hard to digitize, easy to make on chalkboard) fall into this category. Students are responsible for these materials.

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

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, *including during examination periods*. 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). Students who arrive late, leave early, or step out briefly mid-class to handle personal business must do so with a minimum level of disruption to the class in progress.

Rare exceptions to the above may be offered with notice (including just before class) and meritorious reasons (*e.g.*; an in-progress surgery of a close family member).

Make-Up Work Policies

Late-work excuses (extensions) 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. Most requests are granted, excluding those that provide a student or group of students an unfair advantage, 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 issues 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 generally 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.

I reserve the right to grant extensions for other personal reasons as *rare exceptions to the rule* at my sole discretion – advance notice gives you the best chance at a favorable decision. The approval of an extension does not establish precedent for that student (notably, there are some scenarios that I may accommodate only once) or for other students with similar circumstances.

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.

For the purposes of this course, in the above-referenced list of approved absence (extension) 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 (a cousin, your spouse’s sibling’s spouse, 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 reasons for extensions. 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 extensions, 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 November 15 and November 22, inclusive, that are connected to the 2019 ANS “Winter” Meeting will be taken as related to that professional activity and potentially grounds for extensions.

Further, be advised that any approved reasons for extensions 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 extension (or other accommodation) 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 and Projects

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

Homework and 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, ods, numbers, 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.) You may not submit parts of the assignment electronically and parts in hard copy, unless explicitly allowed on that assignment sheet.
- If multiple students in a Project group independently submit electronically, the submission by the student whose name is listed first on the assignment that I post to Canvas will take

precedence. (One student must submit the entire project – different students submitting the project narrative and supporting zip archive is not allowed.)

Many assignments require the use of fluid properties. Use only those properties from EES, including from the tabular listing provided on the course website. *No points will be awarded on problems solved with any other set of properties, including those in the back of T&K.*

For handwritten homework, use pencil or black/dark-blue ink and either white paper (lined or not) or engineering paper. If you choose the combination of pencil and (yellow) engineering paper, write largely/clearly enough to be easily readable. Homework on other paper or with other writing instruments will be accepted, but you will earn no credit for homework that is not readable.

All projects, must be written using word processing or typesetting software. Professional document and figure standards will be enforced on projects. *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

Projects are to 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

Electronic Communication

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.

When sending questions via e-mail, please make sure you provide all the information needed for me to produce an answer or solution. This includes any files, particularly EES files, on which you are working. (Note: I will not open files from students in the following formats: .ppt, .pptx, .doc, .docx; make a PDF and send that if needed.)

Course Website (Canvas)

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).

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.

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.

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>) 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

The University of Florida expects students to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at: <https://gatorevals.aa.ufl.edu/students/>

Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>

Summaries of course evaluation results are available to students at: <https://gatorevals.aa.ufl.edu/public-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.

Commitment to a Safe and Inclusive Learning Environment

The Herbert Wertheim College of Engineering values broad diversity within our community and is committed to individual and group empowerment, inclusion, and the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind, please contact your instructor or any of the following:

- Your academic advisor or Undergraduate/Graduate Program Coordinator [for NE/NES students, these are both also your instructor]
- Robin Bielling, Director of Human Resources, 352-392-0903, rbielling@eng.ufl.edu
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, taylor@eng.ufl.edu
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, nishida@ufl.edu

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:

<https://registrar.ufl.edu/ferpa.html>

Campus Resources

Health and Wellness

U Matter, We Care

Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact umatter@ufl.edu so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

Counseling and Wellness Center:

<http://www.counseling.ufl.edu/cwc>, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

Sexual Discrimination, Harassment, Assault, or Violence

If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the Office of Title IX Compliance, located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, title-ix@ufl.edu

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>