NE 150 Discussion Syllabus

Introduction to Nuclear Reactor Theory

Overview

Administrative

Discussion:

- Group 1 – Wednesday, 12:00-1:00pm, 88 Dwinelle Hall
- Group 2 – Friday, 12:00-1:00pm, 31 Evans Hall

Contact: negus@berkeley.edu

Office Hours: Wednesday 10:30-11:30am, 1106 Etcheverry Hall

Discussion section website: https://mitchnegus.github.io/NE150-discussion/

Topics

The majority of course material will be covered in lecture. Discussion sections will be used to review the material again, ideally in a way that complements what has already been presented. Some points that I specifically hope to address in discussion sections are:

- Atom and weight percent enrichments
- Nuclear structure
- Nuclear reactions
- Cross sections
- Multiplication factors
- The 2/4/6 factor formulae
- Neutron diffusion theory
- Review of differential equations and their solutions
- Solving the diffusion equation to model nuclear systems
- The multigroup diffusion equation
- Point Reactor Kinetics Equations

- Reactivity variations
- Using command line interfaces to perform scientific computing

Please let me know if there are any specific topics you'd like me to cover in more detail. I will do my best to hit topics that will be most useful in completing homeworks and exams, as well as those which I found tricky when I took this course, but discussion section will be most effective if you let me know where you are having difficulty.

A tip from my own experience with this course: **read the assigned chapters before lecture** (and keep some scrap paper nearby to work through some of the derivations as you go)! The lectures can be fast paced, especially if you are trying to absorb the material for the first time. I found that the textbook(s) are accessible enough for students who have taken the course prerequisites without having attended lecture. This does represent a time commitment on your part, but you *will* get significantly more from this course if you come to lecture having read through the material.

Discussion policies

Getting in contact

The best way to reach me is via email. I will do my best to answer within 48 hours (excluding weekends/holidays/breaks), but feel free to send a follow up after that to be sure that I didn't miss the message. If you have a question regarding the course material that you think requires more than single sentence answer, please consider bringing it to office hours instead. I will be able to be much more thorough in my response, and the quality of the answer you receive will be significantly better.

Note: *I will not answer any correspondence initiated within 24 hours of a homework due date or exam*. This will apply universally. Do not leave assignments to the last minute.

Dropping By

Please drop by my office hours if you have questions regarding the course material that isn't resolved either in lecture or discussion. Unfortunately, since I too am a student, I won't be able to stay long after discussion or office hours due to other class/research commitments. If these times do not work for you, I will do my best to accomodate appointments (send me an email), but I cannot guarantee my availability at other times.

Academic Integrity*

UC Berkeley Honor Code

The student community at UC Berkeley has adopted the following Honor Code:

> "As a member of the UC Berkeley community, I act with honesty, integrity, and respect for others."

The hope and expectation is that you will adhere to this code.

Collaboration and Independence

Reviewing lecture and reading materials and studying for exams can be enjoyable and enriching things to do with fellow students. This is recommended. However, unless otherwise instructed, homework assignments are to be completed independently and materials submitted as homework should be the result of one's own independent work.

Cheating

A good lifetime strategy is always to act in such a way that no one would ever imagine that you would even consider cheating. Anyone caught cheating on assignments in this course will be liable to receive a failing grade in the course as well as be reported to the University Center for Student Conduct. As a GSI, I will need to report any instances of cheating to the instructor of record. To guarantee that you are not suspected of cheating, please keep your eyes on your own materials and do not converse with others during exams.

Plagiarism

To copy text or ideas from another source without appropriate reference is plagiarism and may result in a failing grade for your assignment and usually further disciplinary action.

Especially in this class, many of the introductory problems have been thoroughly worked out in texts, in online course readers from other universities, or in the literature. If you use an outside source for your assignment, be sure to cite that resource. This is good practice for working in academic or professional settings. (If you need a good place to start, try imitating the style of a published journal.)

For additional information on plagiarism and how to avoid it, see, for example:

- http://www.lib.berkeley.edu/instruct/guides/citations.html#Plagiarism
- http://gsi.berkeley.edu/teachingguide/misconduct/prevent-plag.html

Academic Integrity and Ethics

Cheating on exams and plagiarism are two common examples of dishonest, unethical behavior. Honesty and integrity are of great importance in all facets of life. They help to build a sense of self-confidence and are key to building trust within relationships, whether personal or professional. There is no tolerance for dishonesty in the academic world, for it undermines what we are dedicated to doing–furthering knowledge for the benefit of

humanity. Your experience as a student at UC Berkeley is hopefully fueled by passion for learning and replete with fulfilling activities. I appreciate that being a student can be stressful. There may be times when there is temptation to engage in some kind of cheating in order to improve a grade or otherwise advance your career. This could be as blatant as having someone else sit for you in an exam, or submitting a written assignment that has been copied from another source. It could also be as subtle as glancing at a fellow student's exam when you are unsure of an answer to a question and are looking for some confirmation. One might do any of these things and potentially not get caught. However, if you cheat, no matter how much you may have learned in this class, you have failed to learn perhaps the most important lesson of all.

**adapted from syllabi from R. Slaybaugh, with permission*

Resources

Course

- Bcourses Site: https://bcourses.berkeley.edu/courses/1468265

Nuclear Data

- KAERI: http://atom.kaeri.re.kr/
- U.S. Nuclear Data http://www.nndc.bnl.gov/

Computing

- DECF (1171 and 1111 Etcheverry): http://www.decf.berkeley.edu/
- The Hacker Within: http://thehackerwithin.github.io/berkeley/
- Software Carpentry: http://software-carpentry.org/lessons.html
    - Specifically, the tutorial on the Unix Shell (http://swcarpentry.github.io/shell-novice/)
- MCNP tutorials from Sandra

Other Campus Resources

- Library: http://www.lib.berkeley.edu/node
- Mental health/CPS: http://www.uhs.berkeley.edu/students/counseling/cps.shtml; 510-642-9494
- Sexual assault support: http://survivorsupport.berkeley.edu/
- Career center: https://career.berkeley.edu/

Computing Accounts

As per the class syllabus, everyone enrolled in NE 150 will be provided with an account with DECF (the Davis-Etcheverry Computing Laboratory). DECF provides on-campus computer laboratories in Etcheverry 1111 and 1171, and the DECF computers can also be accessed remotely via SSH. More information will be provided regarding how to connect to the DECF computers.

After the first midterm, we will be using the DECF computers for running MCNP simulations of critical nuclear systems. In order to do this, you will need a license for MCNP, as it is an export controlled software. The license (specifically for MCNP6) is obtained through RSICC (Radiation Safety Information Computational Center). My recommendation is that you apply for this license as early as possible to ensure that you have access to the software by the time we reach that point of the semester. I will provide more details about this procedure as we progress. If you have difficulties getting an MCNP license, contact me and we will find a workaround–perhaps using Serpent (a similar Monte Carlo code, but with less export controls).

Accessibility

Students with disabilities who need accommodations in order to access this course will be accommodated. Please contact DSP and apply for services.

Students who have disability-related needs in the event of an emergency or evacuation should inform me of any special arrangements that need to be made. Please contact me in office hours or by email.

Also, please let me know if you need any other accomodations to make this semester successful; together we can work out necessary arrangements.

Final Note

This is nuclear science–if you don't understand a concept on the first go, please don't be afraid to ask a question or reach out to me. I understand that there are students taking this course with a strong background in nuclear engineering, while there are others who are in their first year learning about nuclear science. Especially when dealing with nuclear reactors, it is often assumed that the audience is familiar with terminology and language of the field. Whether you don't recognize an acronym or can't figure out how to have your simulated reactor reach a k_{eff} greater than ν, I can't help you if I don't know about the problem.

Good luck, and have fun!