

NUCL 510, Nuclear Reactor Theory I

1. 3 Credit Hours.

Class Time: Tuesdays/Thursdays 9:00-10:15 – Classroom WANG 2579

2. Instructor: Hany Abdel-Khalik, Ph.: 69718, abdelkhalik@purdue.edu

Office hours: FLEX, 205 Gates Rd, W. Lafayette – Tuesdays/Thursdays 11:00a – 12:00p.

3. Textbook(s): J. Duderstadt and L. Hamilton, Nuclear Reactor Analysis, Wiley, 1976

4. Course Description:

This course is designed to students with basic nuclear reactor physics background. The class starts with quick overview of basic principles covered in undergraduate reactor physics classes, and then works on developing the insight required to support the application of reactor physics concepts to realistic design calculations.

Methodologies of neutron flux calculations, introduction to angular flux and transport equation, diffusion theory approximation and slowing down theory, flux space and energy separation, material buckling, resonance absorption, Doppler effect, multi-group diffusion theories, multiplication factor four factor formula. Basic Numerical methods to solve multi-group diffusion theory. Reactor kinetics, delayed neutrons, point reactor kinetics, transient behavior, reactivity feedback and balances, and safety implications, criticality safety, perturbation theory and uncertainty analysis for criticality safety.

5. Prerequisites: NUCL 310, or any equivalent introductory course in reactor physics. If you don't meet prerequisites. The course material is presented at an intermediate level, not suitable for students with no background on reactor physics.

6. Classification: Required

7. Learning Objectives:

- a. Students expected to develop an understanding of reactor physics value for engineering design calculations, and to learn how it is applied to make engineering design decision regarding material choice, composition, type, and operating conditions to sustain and control chain reactor over reactor operating horizon.
- b. Students to learn how to develop a computer code to solve a reactor physics problem.

Grading: Mid-term examination: 30%, Final Examination: 30%, Projects: 10%; Homework Assignments 20%; Oral Examination: 10%, Bonus Assignments: 10%.
No makeup assignments, and No grade curving. Following Code of Integrity (PASS or FAIL)

Grades: A+>=96, A>=90, B>=80, C>=70, D>=60, F<60

Exams: All exams are take-home

Assignments: Excluding the two exams, all assignments/projects/bonuses are to be typed electronically. Hand-written assignments will receive ZERO grade. For on-campus students, a print out of your assignment is to be returned at the beginning of the class. For online students, assignments and exams can be emailed on the due date/time as single PDF attachment to abdelkhalik@purdue.edu. Each attachment must not exceed 3MB in size.

Class Structure: Each class consists of three segments, revision of previous class material, new material will be presented following a problem-based learning approach, and wrap-up on material presented and directions for next class.

Disability: If you have disability requiring special attention, please notify me immediately to take appropriate measures

Expectations: All assignments, including exams, projects, and bonuses, should state clearly any references you may have used. No references cited implies the work is your OWN. Return assignments on time. Late assignments will be subjected to 20% penalty for each day after due date without a valid excuse (up to two days only). Cheating/Copying/Plagiarism will be severely punished. Any assignment (including HW, projects, exams, etc.) containing a SINGLE cheating incident will receive zero grade for entire assignment. More than two cheating incidents will be reported to your academic advisor and student conduct office and will receive an F grade in the course. Take pride in your work. SILENCE your cell phones and other electronics while you are in class and when you come see me in the office

Class Material: The textbook, class notes, all assignments, class schedule, assignments, examinations, etc. will be emailed to you. Make sure your spam-filter is functioning properly. You will be receiving emails primarily from me and occasionally from the teaching assistants. 'My-email-is-not-working', or 'I-have-not-received-this-email' type excuses will not be accepted.