

NUCL 310, Introduction to Neutron Physics CRN 35724

1. 3 Credit Hours

2. Instructor(s): Yunlin Xu

Email: yunlin@purdue.edu

Office hours: Friday 1:30 -5:00pm

Office location: LMBS 5282

Lectures MWF 9:30 - 10:20 am, Grissom Hall 102

3. Textbook(s):

Fundamentals of Nuclear Reactor Physics,

E. E. Lewis, 1st Editions

ISBN-13: 978-0123706317 ISBN-10: 0123706319

4. Course Description

Introductory to neutron physics calculations in nuclear reactors. Basic introduction and development of cross-sections energy dependencies, scattering cross-section, capture cross-section, Doppler Broadening. Derivation of neutron balance equation in one variable, e.g., time for point kinetics equation, space for diffusion theory, and energy for basic slowing down theory. Introduction of depletion calculations, and basic introduction to reactivity balance equation and reactivity coefficients

5. Pre-requisite:

Introductory calculus and introductory ordinary differential equations course, and introduction to nuclear physics.

6. Classification: Required

7. Learning Objectives

- a. To explain what determines the power distribution in nuclear reactor and how it changes.
- b. To build transport equation for neutron flux by inductive method.
- c. To derive simpler forms of neutron equation, such as neutron diffusion equation, multi-group equation and slowing down equations.
- d. To solve diffusion equation analytically for simplified cases.
- e. To solve diffusion or transport equations numerically.
- f. To searching critical parameters in nuclear reactor design and operation.
- g. To explain the reactivity feedback and safety implication in operation.
- h. To explain reactivity balance in design.
- i. To solve simple transient problem with point kinetics

8. ABET Student Outcomes

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
3. An ability to communicate effectively with a range of audiences.
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.
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

9. Grades Polices:

Home works: 50% of total score

Exams:

Midterm, 20% of total score

Final, 20% of total score

Attendance and Participation: 10% of total score

Guaranteed floors for letter grade

F	D-	D	D+	C-	C	C+	B-	B	B+	A-	A+
60	63	66	70	73	76	80	83	86	90	93	

No curve with percentage

Possible Adjustments:

Whole class adjustment if there are unreasonable requirements in home works/exams/projects

Minor adjustment (≤ 5 points) for students who made significant effort and improvement for the course

Home works are due on class, can be submitted earlier. Late submissions will have 5% per day reduction in score, and not accepted after a week from due day.

Regrade requests must be submitted with a written justification within a week after grade released to students.