NUCL 510 Nuclear Reactor Theory I
Fall 2011

Class schedule: Tuesday and Thursday 4:30 pm – 5:45 pm

Class room: UNIV 217

Instructor: Won-Sik Yang
Office: NUCL132G; Tel: 49-44710; email: yang494@purdue.edu
Office hours: Tuesday and Thursday, 3:20 pm – 4:20 pm

Course description: Neutron interactions, neutron balance equations and fundamental neutronics problems, neutron slowing down theory, resonance absorption, introduction to transport theory, multi-group diffusion theory, and numerical techniques including nodal methods.

Textbook: Karl O. Ott and Winfred A. Bezella, "Introductory Nuclear Reactor Statics (Revised Edition)," American Nuclear Society (1989).

References: E. E. Lewis, "Fundamentals of Nuclear Reactor Physics," Elsevier Inc. (2008).
W. M. Stacey, "Nuclear Reactor Physics," John Wiley & Sons, Inc. (2001).
J. H. Lamarsh, "Introduction to Nuclear Reactor Theory," Addison-Wesley Publishing Company Inc. (1966).

Attendance: Since class discussion is a major course ingredient, regular attendance is mandatory.

Campus emergency: In the event of a major campus emergency, course requirements, deadlines and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances. Information above changes in this course in such emergencies would be obtainable from Blackboard Vista.

Homework: Homework sets will be assigned at least one week in advance and will be due to at the beginning of Thursday class, unless specified otherwise. All work must be shown clearly and legibly. No late homework is accepted.

Course grading: Exams (2) 60 %, Homework 40 %

Final grade scale: A=85-100; B=75-84; C=65-74; D=55-64; F<55

Others: This syllabus is subject to change. Please visit Blackboard Vista to get the latest class information. Materials provided in class and in Blackboard Vista are for your personal use only. Thus, do not distribute them to public domain.

Class	Date	Topics	HW set	Due date
1	8/23/11	Review of required nuclear physics		
2	8/25/11	Scattering processes (1)	#1	9/1/11
3	8/30/11	Scattering processes (2)		
4	9/1/11	Evaluated nuclear data files	#2	9/8/11
5	9/6/11	Boltzmann equation (1)		
6	9/8/11	Boltzmann equation (2)	#3	9/15/11
7	9/13/11	Integral transport equation		
8	9/15/11	Pn and diffusion approximations	#4	9/22/11
9	9/20/11	Multi-group approach and group constants		
10	9/22/11	Fundamental neutron problems	#5	9/29/11
11	9/27/11	Estimates of criticality for thermal reactors		
12	9/29/11	Separation of space and energy dependencies	#6	10/13/11
13	10/4/11	Flux separability applications for two groups		
14	10/6/11	Midterm Exam		
	10/11/11	No Class (October Break)		
15	10/13/11	Slowing down in hydrogen		
16	10/18/11	Slowing down in non-hydrogenous materials		
17	10/20/11	Resonance absorption during slowing down	#7	10/27/11
18	10/25/11	Flux shapes in homogeneous single regions (Satvat)		
19	10/27/11	Flux solutions in source-sink problems (Satvat)	#8	11/3/11
20	11/1/11	Basic approximations for resonance absorption		
21	11/3/11	Improved treatment of resonance absorption	#9	11/10/11
22	11/8/11	Resonance absorption in heterogeneous systems (1)		
23	11/10/11	Resonance absorption in heterogeneous systems (2)	#10	11/17/11
24	11/15/11	Temperature-dependent resonance absorption		
25	11/17/11	Thermal neutron spectrum (1)		
26	11/22/11	Thermal neutron spectrum (2)	#11	11/29/11
	11/24/11	No Class (Thanksgiving Vacation)		
27	11/29/11	Explicit few-group theories		
28	12/1/11	Finite difference methods	#12	12/8/11
29	12/6/11	Overall solution schemes		
30	12/8/11	Nodal methods		
31	12/13/11	Final Exam		