



Jordan University of Science and Technology
Faculty of Engineering
Nuclear Engineering Department

NE448 Nuclear Reactor Lab
Second Semester 2018-2019

Course Catalog
3 Credit Hours. Experimental measurements of basic nuclear reactor parameters, flux measurement, reactor period, approach to critical. Reactor operation and reactor safety. Neutron activation analysis.

Text Book	
Title	Experiments handouts
Author(s)	-
Edition	1st Edition
Short Name	Ref #1
Other Information	

Course References

Short name	Book name	Author(s)	Edition	Other Information
Ref #2	Radiation Detection and Measurement	Knoll, G. F.	3rd Edition	
Ref #3	Introduction to Nuclear Engineering	Lamarsh, T.R	2nd Edition	

Instructor	
Name	Dr. GHADEER AL-MALKAWI
Office Location	-
Office Hours	Sun : 10:30 - 11:30 Sun : 11:30 - 12:30 Sun : 13:30 - 14:30 Tue : 10:30 - 11:30 Tue : 11:30 - 12:30 Tue : 13:30 - 14:30 Wed : 08:30 - 09:30 Thu : 10:30 - 11:30

Email	ghmalkawi@just.edu.jo
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Class Schedule & Room
Section 1: Lecture Time: Sun, Tue, Thu : 14:30 - 15:30 Room: E2117

Prerequisites		
Line Number	Course Name	Prerequisite Type
2004130	NE413 Radiation Detection And Measurement Lab li	Prerequisite / Study
2004410	NE441 Nuclear Reactors Analysis	Prerequisite / Study

Tentative List of Topics Covered		
Weeks	Topic	References
Weeks 1, 2	Introduction to JSA	
Week 3	Approach-to-criticality experiment	
Week 4	Rossi-alpha method	
Week 5	Feynman-alpha method	
Week 6	Source-jerk experiment	
Week 8	Axial and radial flux distribution	
Week 9	Approach to Criticality at JRTR	
Week 10	Measurement of Excess Reactivity	
Week 11	Measurement of Shutdown Margin	
Week 12	Measurement of Reactivity Worth of Control Absorber Rods by Rod Drop Method	
Week 13	Calibration of Control Absorber Rods by Rod Swap Method	
Week 14	Measurement of Power Reactivity Coefficient	

Mapping of Course Outcomes to Program Student Outcomes	Course Outcome Weight (Out of 100%)	Assessment method
Verify through experiment the predictions of reactor theory for the time-dependent behavior of the reactor in Jordan Subcritical Assembly (JSA) and Jordan Research and Training Reactor (JRTR). [11, 14, 16]	10%	Mid-term Exam, Lab/class participation, Final Exam

Students must be able to explain the fundamental theory in critical approach experiment and perform criticality calculation in JSA and JRTR [11, 14, 16]	20%	Mid-term Exam, Reports and Quizzes, Final Exam
Students must be able to calculate the reactivity and hence the multiplication factor of JSA using different methods [11, 14, 16]	25%	Mid-term Exam, Reports and Quizzes, Final Exam
Students must be able to measure the excess reactivity of the current JRTR core by measuring the reactivity worth of all control absorber rods [11, 14, 16]	5%	Reports and Quizzes, Final Exam
Students must be able to measure the differential and the integral reactivity worth of each control absorber rod (CAR) in JRTR by the rod swap method. [11, 14, 16]	5%	Reports and Quizzes, Final Exam
Students must be able to calculate neutron flux distribution from the results of activated foils. [11, 14, 16]	10%	Reports and Quizzes, Final Exam
Students must be able to perform identification of radionuclides by gamma-ray spectroscopy using HpGe detector [11, 14, 16]	8%	Reports and Quizzes, Final Exam
Increase the students level of proficiency in technical report writing and collaborate effectively with their teammates [13, 15]	17%	Reports and Quizzes, Lab/class participation

Relationship to Program Student Outcomes (Out of 100%)						
1	2	3	4	5	6	7
27.67		8.50	27.67	8.50	27.67	

Evaluation	
Assessment Tool	Weight
Mid-term Exam	15%
Reports and Quizzes	40%
Lab/class participation	5%
Final Exam	40%

Policy

Attendance	<p>Attendance to all laboratory sessions is required. Students who have unexcused lab absences will receive a grade of zero for that lab. The intent of this course is for the student to prepare reports based upon individual experience. Therefore, unexcused absence from lab makes it impossible to submit a report for credit. Where an absence is deemed excusable by the instructor with prior notification, the student may be allowed to make up the lab. If an emergency arises, you must inform the instructor or the teaching assistant before class.</p> <p>Quizzes will be given at the beginning of each lab session, so the coming section of the lab note should be studied before the lab. Any missed quizzes will count as zero and cannot be made up.</p>
Exam Policy	<p>There will be no make-up exams except in extreme circumstances at the discretion of the instructor. The instructor has to be informed in advance (by email, phone, personal ...). You will be asked to provide proper documentation.</p>
Reports Policy	<p>Laboratory reports are due prior to the start of the lab period immediately following the one when the experiment was performed, e.g. if you performed an experiment on Tuesday the 12th, the report is due at the beginning of your lab period on the 19th. Any reports turned in later than the beginning of the lab period will be recorded as late. Late labs will be assessed as a 25% penalty for each day it is late.</p>
Laboratory Rules	<ol style="list-style-type: none"> 1.No smoking, drinking or eating in the laboratory, this includes coffee and carbonated drinks, candy or gum. 2.The laboratory is to be restored to a neat and orderly condition after the laboratory experiments are finished. 3.No visiting friends. They may distract you from your work and they do not know the laboratory rules and may violate them. 4.Proper attire is required. 5.Show up before the scheduled start of the lab, as a courtesy to your lab partner and classmates.
SECURITY	<ol style="list-style-type: none"> 1.The Reactor Laboratory is a highly restricted area. You must be accompanied by your instructor or reactor staff to remain in the area. 2.DO NOT BLOCK OPEN DOORS OR ATTEMPT TO DEFEAT LOCKS. 3.Do not attempt to operate or adjust equipment except on laboratory set-ups under direction of laboratory instructor or reactor operating staff. 4.Always report any condition you feel is potentially unsafe to your instructor or the Reactor Supervisor. 5.Refer any questions on radiation safety to instructor or laboratory staff.
Disabled students	<p>Students with any sort of limitation or disability should discuss its consequences with instructor prior to the start of the course.</p>
Emergency Provisions	<p>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 beyond the instructor's control. Here are ways to get information about changes in this course:</p> <ul style="list-style-type: none"> - E-learning announcements - Instructor email (ghmalkawi@just.edu.jo)