

Zarqa University

Faculty of Engineering Technology
Department: Energy Engineering
Course title:



Prerequisite: Fluid Mechanics I
Instructor: TBD
Lecture's time: TBD
Semester: TBD
Office Hours: TBD

Nuclear power engineering

Course description:

This course covers the fundamentals of nuclear energy. Atomic and nuclear physics; interaction of radiation with matter. Nuclear reactor operation; reactor components, nuclear cycles, neutron diffusion and moderation. Reactor shielding. Fuel reprocessing and waste disposal. Reactor licensing and safety. Economics and environmental concerns.

Aims of the course:

- 1- Generating large quantities of electricity is known as base load electricity - reliably without emitting any harmful gases.
- 2- It reduces the environmental impacts, whether on land or natural resources.
- 3- Provide a basic source of heat known as nuclear fission (splitting of atoms).
- 4- Study of radioactive materials and isotopes.
- 5- Building and designing nuclear reactors.
- 6- Finding energy alternatives.

Intended Learning Outcomes (ILOs):

- 1- Ability to know atomic and nuclear physics .
- 2- Ability to know atomic and nuclear interactions .
- 3- Ability to know radiation physic and radiation detection .
- 4- Deriving the equations of neutron interactions , nuclear cross section , and nuclear half lives .
- 5- Analyzing fission and fusion reactor physics .Analyze three-phase systems.



Course structures:

Day	C. hrs	ILO	Topic(s)	Teaching Procedure *	Learning Activities **	Learning Platform
Sun 21/2/2021	1	1	Ch1: Introduction to steady-State reactor Core	Interactive lectures, using PPT slides/class notes, digital pen.	Lecturing, discussion, problem solving.	Teams & Moodle
Tue 23/2/2021	1	1	Ch1: Infinite multiplication factors	Interactive lectures, using PPT slides/class notes, digital pen.	Lecturing, discussion, problem solving.	Teams & Moodle
Thu 25/2/2021	1	1	Ch1: Following to - Infinite multiplication factors	Interactive lectures, using PPT slides/class notes, digital pen.	Lecturing, discussion, problem solving.	Teams & Moodle
Sun 28/2/2021	1	1	Ch1: Four-factor equation	Interactive lectures, using PPT slides/class notes, digital pen.	Lecturing, discussion, problem solving.	Teams & Moodle
Tue 2/3/2021	1	1	Ch1: Following to- Four-factor equation.	Interactive lectures, using PPT slides/class notes, digital pen	Lecturing, discussion, problem solving.	Teams & Moodle
Thu 4/2/2021	1	1, 2	Ch1: Calculation of response escape prob.	Interactive lectures, using PPT slides/class notes, digital pen.	Lecturing, discussion, problem solving.	Teams & Moodle
Sun 7/3/2021	1	1, 2	Ch1: Following to - Calculation of response escape prob.	Interactive lectures, using PPT slides/class notes, digital pen.	Homework 1	Teams & Moodle
Tue 9/3/2021	1	1, 2	Ch1: Neutron current density.	Interactive lectures, using PPT slides/class notes, digital pen.	Lecturing, discussion, problem solving.	Teams & Moodle
Thu 11/3/2021	1	1, 2	Ch1: Following to neutron current density.	Interactive lectures, using PPT slides/class notes, digital pen.	Lecturing, discussion, problem solving.	Teams & Moodle
Sun 14/3/2021	1	2	Chp1: Diffusion equations	Interactive lectures, using PPT slides/class notes, digital pen.	Lecturing, discussion, problem solving.	Teams & Moodle

Day	C. hrs	ILO	Topic(s)	Teaching Procedure *	Learning Activities **	Learning Platform
Tue 16/3/2021	1	2	Chp1: Following-Diffusion equations.	Interactive lectures, using PPT slides/class notes, digital pen.	Lecturing, discussion, problem solving.	Teams & Moodle
Thu 18/3/2021	1	2	Ch2: Infinite slab reaction	Interactive lectures, using PPT slides/class notes, digital pen.	Lecturing, discussion, problem solving.	Teams & Moodle
Sun 21/3/2021	1	3	Ch2: Following to-Infinite slab reaction	Interactive lectures, using PPT slides/class notes, digital pen.	Homework 2	Teams & Moodle
Tue 23/3/2021	1	2	Ch2: Flux distribution in rectangular core	Interactive lectures, using PPT slides/class notes, digital pen.	Lecturing, discussion, problem solving.	Teams & Moodle
Thu 25/3/2021	1	2	Chp2: Following to -: Flux distribution in rectangular core.	Interactive lectures, using PPT slides/class notes, digital pen.	Lecturing, discussion, problem solving.	Teams & Moodle
Sun 28/3/2021	1	2	Ch2: Spherical core	Interactive lectures, using PPT slides/class notes, digital pen.	Lecturing, discussion, problem solving.	Teams & Moodle
Tue 30/3/2021	1	3,4	Ch2: Following to - Spherical core	Interactive lectures, using PPT slides/class notes, digital pen.	Lecturing, discussion, problem solving.	Teams & Moodle
Thu 1/4/2021	1	2,3	Ch2: Cylindrical core	Interactive lectures, using PPT slides/class notes, digital pen.	Lecturing, discussion, problem solving.	Teams & Moodle
Sun 4/4/2021	1	2,3	Ch2: Following to - Cylindrical core	Interactive lectures, using PPT slides/class notes, digital pen.	Homework 3	Teams & Moodle
Tue 6/4/2021	1	2,3	Ch2: Reflected reactor core	Interactive lectures, using PPT slides/class notes, digital pen.	Lecturing, discussion, problem solving.	Teams & Moodle
Thu 8/4/2021	1	2,3	Ch2: Following to -: Reflected reactor core	Interactive lectures, using PPT slides/class notes, digital pen.	Student presenting role	Teams & Moodle



Day	C. hrs	ILO	Topic(s)	Teaching Procedure *	Learning Activities **	Learning Platform
Sun 11/4/2021	1	2,3	Ch2: Spherical core with finite blanket.	Interactive lectures, using PPT slides/class notes, digital pen.	Student presenting role	Teams & Moodle
Tue 13/4/2021	1	3	Ch3: Two-groups theory	Interactive lectures, using PPT slides/class notes, digital pen.	Student presenting role	Teams & Moodle
Thu 15/4/2021	1	3	Ch3: following to- Two-groups theory	Interactive lectures, using PPT slides/class notes, digital pen.	Lecturing, discussion, problem solving.	Teams & Moodle
Tue 18/4/2021	1	3	Ch3: Following to- Two-groups theory	Interactive lectures, using PPT slides/class notes, digital pen.	Lecturing, discussion, problem solving.	Teams & Moodle
Sun 20/4/2021	1		Expectedly Mid Exam		Mark: 35%	Online Exam system
Thu 22/4/2021	1	3	Ch3: Fast reactors	Interactive lectures, using PPT slides/class notes, digital pen.	Lecturing, discussion, problem solving.	Teams & Moodle
Sun 25/4/2021	1	3	Ch3: Following to- fast reactors	Interactive lectures, using PPT slides/class notes, digital pen.	Lecturing, discussion, problem solving.	Teams & Moodle
Tue 27/4/2021	1	3	Ch3: One-group theory for fast reactors	Interactive lectures, using PPT slides/class notes, digital pen.	Lecturing, discussion, problem solving.	Teams & Moodle
Thu 29/4/2021	1	3	Ch3: Following to -One-group theory for fast reactors	Interactive lectures, using PPT slides/class notes, digital pen.	Lecturing, discussion, problem solving.	Teams & Moodle
Sun 2/5/2021	1	2,3	Ch3: Fast core blanket	Interactive lectures, using PPT slides/class notes, digital pen.	Lecturing, discussion, problem solving.	Teams & Moodle
Tue 4/5/2021	1	2,3	Ch3: Following to- fast core blanket	Interactive lectures, using PPT slides/class notes, digital pen.	Lecturing, discussion, problem solving.	Teams & Moodle

Day	C. hrs	ILO	Topic(s)	Teaching Procedure *	Learning Activities **	Learning Platform
Thu 6/5/2021	1	3,4	Ch3: Multi-group theory	Interactive lectures, using PPT slides/class notes, digital pen.	Lecturing, discussion, problem solving.	Teams & Moodle
Sun 9/5/2021	1	3,4	Ch3: Following to -Multi-group theory calculations	Interactive lectures, using PPT slides/class notes, digital pen.	Lecturing, discussion, problem solving.	Teams & Moodle
Tue 11/5/2021	1	3,4	Ch3: Following to – Multi-group theory	Interactive lectures, using PPT slides/class notes, digital pen.	Homework 4	Teams & Moodle
Thu 13/5/2021			Eid Al Fitter (expected)			
Sun 16/5/2021	1	4	Ch4: Transient reactor behaviour and control	Interactive lectures, using PPT slides/class notes, digital pen.	Lecturing, discussion, problem solving.	Teams & Moodle
Tue 18/5/2021	1	4	Ch4: Following to - Transient reactor behaviour and control	Interactive lectures, using PPT slides/class notes, digital pen.	Lecturing, discussion, problem solving.	Teams & Moodle
Thu 20/5/2021	1	4	Ch4: Neutron life time	Interactive lectures, using PPT slides/class notes, digital pen.	Lecturing, discussion, problem solving.	Teams & Moodle
Sun 23/5/2021	1	7	Ch4: Following to- Neutron life time and reactivity	Interactive lectures, using PPT slides/class notes, digital pen.	Lecturing, discussion, problem solving.	Teams & Moodle
Tue 25/5/2021			Independence anniversary			
Thu 27/5/2021	1	4,5	Ch5: Diffusion equations for transient reactor	Interactive lectures, using PPT slides/class notes, digital pen.	Lecturing, discussion, problem solving.	Teams & Moodle
Sun 30/5/2021	1	4,5	Ch5: Following to- Diffusion equations for transient reactor.	Interactive lectures, using PPT slides/class notes, digital pen.	Lecturing, discussion, problem solving.	Teams & Moodle
Tue 1/6/2021	1	4,5	Ch5: Radiation damage	Interactive lectures, using PPT slides/class notes, digital pen.	Lecturing, discussion, problem solving.	Teams & Moodle



Day	C. hrs	ILO	Topic(s)	Teaching Procedure *	Learning Activities **	Learning Platform
Thu 3/6/2021	1	4,5	Ch5: Reactor's materials	Interactive lectures, using PPT slides/class notes, digital pen.	Lecturing, discussion, problem solving.	Teams & Moodle
TBD	1		Final Exam		Mark: 50%	Online Exam system
Total	46					

Textbook:

Textbook: Basic Nuclear Eng.
Supplementary Textbook/ Material(s):
<ul style="list-style-type: none"> PPT slides on Moodle
Equipment: Internet Connection, Laptops, and Webcams

Assessment Methods:

Method	Grade	Date	Platform	Assignment
Midterm Exam	%35	Fixed by the Department	Moodle/Online Exam system	
Participation, Presentation, Attendance...etc	%15	During Semester	Moodle	Average of quizzes/assignments
Final Exam	%50	Fixed by the Department	Moodle/Online Exam system	

