



Çanakkale Onsekiz Mart University

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Course Information

COURSE INFORMATION

Course Title	Code	Semester	L+U Hour	Credits	ECTS
Neutron Transport Theory	FZ5046		3 + 0	3.0	7.5

Prerequisites	None
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Language of Instruction	Turkish
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Course Level	Second Cycle
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Course Type	Elective
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Mode of delivery	Face to face
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Course Coordinator	Assoc. Prof. Dr. Emine Dilara AYDIN
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Instructors	Assoc. Prof. Dr. Emine Dilara AYDIN
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Assistants	
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Course Objectives	Aim of the course is to give the concepts and methods of transport theory in details.
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Course Content	Analytical treatment of neutron transport theory; solution methods of integrodifferential and integral Boltzmann equations, adjoints; energy dependent methods using singular eigen functions, variational methods, orthogonal polynomials and thermalization; current analytical techniques in transport theory, numerical methods including spherical harmonics, discrete ordinates, and Monte Carlo techniques; non-linear transport phenomena.
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Course Learning Outcomes	1) After completion of this course students will be able to: perceive the concepts of the Transport Theory. 2) Learn and develop solution methods of the Transport Theory.
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WEEKLY COURSE CONTENT

Week	Topics	Teaching and Learning Methods and Techniques	Study Materials
1. Week	Introduction to reactor physics in the context of Nuclear Engineering	Oral Lecture	
2. Week	Mathematical basis: Functions and distributions, probability densities, Change of variable, Dirac delta distribution, probability tables, Solid angles, spherical harmonics.	Oral Lecture	
3. Week	Kinematics of elastic neutron-nucleus collision and determining the	Oral Lecture	
4. Week	The model of the compound nucleus. Defining and using sections	Oral Lecture	
5. Week	Doppler and thermal motion of nuclei. Convolution of the sections	Oral Lecture	
6. Week	Definition of the neutron flux and current. Presentation of Fick's law	Oral Lecture	

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Physics (Master)

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7. Week	The Boltzmann equation for the study of neutron transport: definition	Oral Lecture	
8. Week	Mid-term Exam		
9. Week	Discretization multigroup cross sections and the equation	Oral Lecture	
10. Week	Discretization multigroup cross sections and the equation	Oral Lecture	
11. Week	The collision probability method: Definition, reducing the	Oral Lecture	
12. Week	The collision probability method: Reaction to geometries	Oral Lecture	
13. Week	Computing network: slow neutrons and self-protection	Oral Lecture	
14. Week	Calculation of neutron leakage and diffusion coefficient.	Oral lecture	
15. Week	Timely evolution of the nuclei	Oral Lecture	
16. Week	Final Exam		

RESOURCES

Recommended Sources
Henry Allan F., Nuclear Reactor Analysis, MIT Press; ASIN: 0262080818; 1980.
Duderstadt and Martin, Transport Theory, Wiley, New York, 1979.
Duderstadt J. J. and Hamilton L. J., Nuclear Reactor Analysis, John Wiley & Sons, Inc., 1976.
Miller W.F., Jr. (Editor), Lewis E. E., Computational Methods of Neutron Transport, American Nuclear Society; ASIN: 0471092452; Reprint edition January 1993.
Marchuk G., Lebedev V.I., Numerical Methods in the Theory of Neutron Transport, Taylor & Francis; ISBN: 3718601826; 2Nd&Rvsd edition, March 1986.

ASSESSMENT

Measurement and Evaluation Methods and Techniques
Mid-term Exam, Attendance, Problem Solving, Quiz, Final Exam

COURSE CATEGORY

Course Category	Percentage
Support Courses	% 100

CONTRIBUTION OF COURSE LEARNING OUTCOMES TO PROGRAMME OUTCOMES

Programme Outcomes	Contribution Level	DK1	DK2
PY1	3	4	3
PY2	3	3	3
PY3	4	4	4
PY4	4	4	4
PY5	3	3	3
PY6	4	4	4
PY7	4	4	4
PY8	3	3	3
PY9	3	3	3
PY10	2	3	2
PY11	3	3	3
PY12	4	4	4

PY13	4	4	4
PY14	4	4	4
PY15	4	4	4

*DK = Course's Contribution.

	0	1	2	3	4	5
Level of contribution	None	Very Low	Low	Fair	High	Very High

ECTS CREDITS AND COURSE WORKLOAD

Event	Quantity	Duration (Hour)	Total Workload (Hour)
Class Hours (14 weeks)	14	3	42
Final Exam Preparation	1	15	15
Preliminary Study	14	2	28
Mid Term Exam 1	1	3	3
Assignment 1	4	2	8
Mid Term Exam Preparation	1	15	15
Final Exam	1	3	3
Quiz 1	4	2	8
Further Study	14	5	70
Total Workload			192
Total Workload / 25.5 (s)			7.53
ECTS Credit of the Course			8

