Course Information

COURSE INFORMATION

Course Title	Code	Semester	L+U Hour	Credits	ECTS
Neutron Transport Theory I	FZ-6021		3 + 0	3.0	7.5

Prerequisites	None

Language of Instruction	Turkish
Course Level	Third Cycle
Course Type	Elective
Mode of delivery	Face to face
Course Coordinator	Assoc. Prof. Dr. Emine Dilara AYDIN
Instructors	Assoc. Prof. Dr. Emine Dilara AYDIN
Assistants	
Course Objectives	It is aimed to give the concepts and methods of transport theory that are necessary for advanced study in the field of reactor theory.
Course Content	Analytical treatment of neutron transport theory; solution methods of integrodifferential and integral Boltzmann equations, adjoins; 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.
Course Learning Outcomes	1) After completion of this course students will be able to: understand the fundamental concepts of neutron transport theory. 2) Be familiar with analytical forms of the transport equation. 3) Learn analytical methods of solutions in various geometries. 4) Be familiar with Numerical evaluations of analytical representations. 5) Understand Semi-analytical benchmarking techniques.

WEEKLY COURSE CONTENT

Week	Topics	Teaching and Learning Methods and Techniques	Study Materials
1. Week	Derivation of the transport equation: Sketch of the statistical mechanical derivation, Phase space derivation, The eight forms of the transport equation.	Lecturing Question-answer Discussion Homework	
2. Week	Derivation of the transport equation: Sketch of the statistical mechanical derivation, Phase space derivation, The eight forms of the transport equation.	Lecturing Question-answer Discussion Homework	
3. Week	Neutron slowing down and thermalization: Elastic scattering: An	Lecturing Question-	

Quick Access

Physics (PhD)
- Qualification Awarded
- Level of Qualification
- Qualification Requirements and Regulations
- Specific Admission Requirements
- Recognition of Prior Learning
- Profile of the Program
- Program Key Learning Outcomes
- Occupational Profile of Graduates
- Access to Further Studies
- Course Structure & Credits
- Exam Regulations & Assessment & Grading
- Graduation Requirements
- Mode of Study
- Programme Director(or Equivalent)
- Evaluation Questionnaire
- TYYÇ

Course Information
- Course Information
- Weekly Course Content
- Resources
- Course Category
- CONTRIBUTION OF COURSE LEARNING OUTCOMES TO PROGRAMME OUTCOMES
- ECTS credits and course workload

	analytical solution.	answer Discussion Homework	
4. Week	Neutron slowing down and thermalization: Multigroup approximation	Lecturing Question-answer Discussion Homework	
5. Week	Monoenergetic transport: Derivation of the one-group equation Fourier transform solution in an infinite medium.	Lecturing Question-answer Discussion Homework	
6. Week	Monoenergetic transport: Fn solution in a finite slab medium.	Lecturing Question-answer Discussion Homework	
7. Week	Monoenergetic transport: Fn solution in a finite cylinder.	Lecturing Question-answer Discussion Homework	
8. Week	Mid-term Exam		
9. Week	Multigroup Transport Theory: Fourier transform solution in an infinite medium.	Lecturing Question-answer Discussion Homework	
10. Week	Multigroup Transport Theory: Green's function solution in a slab.	Lecturing Question-answer Discussion Homework	
11. Week	Multidimensional transport theory: 2D searchlight problem.	Lecturing Question-answer Discussion Homework	
12. Week	Multidimensional transport theory: Infinite medium 3D multigroup neutron transport.	Lecturing Question-answer Discussion Homework	
13. Week	The future of analytical benchmarking	Lecturing Question-answer Discussion Homework	
14. Week	Benchmarking in-place.	Lecturing Question-answer Discussion Homework	
15. Week	Embedded benchmarks.	Lecturing Question-answer Discussion Homework	
16. Week	Final Exam		

RESOURCES

Recommended Sources
Stacey Weston M., Nuclear Reactor Physics, Wiley-Interscience; ISBN: 0471391271; 1. Edition, January 16, 2001.
Lamarsh John R., Introduction to Nuclear Reactor Theory , Amer Nuclear Society; ISBN: 0894480405; September 2002.
Bell George I. and Glasstone Samuel, Nuclear Reactor Theory, Krieger Publishing Company, 1985.
Duderstadt J. J. and Hamilton L. J., Nuclear Reactor Analysis, John Wiley & Sons, Inc., 1976.
Henry Allan F., Nuclear Reactor Analysis, MIT Press; ASIN: 0262080818; June 1975.
Duderstadt J.J. and Martin W.R., Transport Theory, Wiley , New York,1979.
Zweifel P. F., Reactor Physics, McGraw-Hill; ASIN: 0070735972.

ASSESSMENT

Measurement and Evaluation Methods and Techniques
Observation, Written Exam, Attendance, Question-answer, Problem Solving, Quiz

COURSE CATEGORY

Course Category	Percentage
Support Courses	% 100

CONTRIBUTION OF COURSE LEARNING OUTCOMES TO PROGRAMME OUTCOMES

Programme Outcomes	Contribution Level	DK1	DK2	DK3	DK4	DK5
PY1	4	4	5	4	5	4
PY2	4	4	4	5	5	4
PY3	4	5	4	4	4	5
PY4	3	3	3	3	3	5
PY5	4	5	4	4	5	3
PY6	3	5	3	3	2	3
PY7	2	3	2	2	2	2
PY8	4	4	5	4	4	5
PY9	4	4	4	4	4	5
PY10	4	4	4	4	5	4
PY11	4	4	4	4	5	4
PY12	3	4	3	4	3	3
PY13	4	4	4	4	4	3
PY14	5	4	5	5	4	5
PY15	4	4	4	3	4	5

*DK = Course's Contrubution.

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

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ECTS CREDITS AND COURSE WORKLOAD

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