Course Information

COURSE INFORMATION

Course Title	Code	Semester	L+U Hour	Credits	ECTS
Statistical Mechanics	FZ5003		3 + 0	3.0	7.5

Prerequisites	None
Language of Instruction	Turkish
Course Level	Second Cycle
Course Type	Elective
Mode of delivery	Face to face
Course Coordinator	Assoc. Prof. Dr. Vildan BİLGİN
Instructors	Prof. Dr. İsmail TARHAN
Assistants	
Course Objectives	The main objective of this course is to provide knowledge about the foundation of physical properties of classically and quantum mechanically many-body systems.
Course Content	The main topics of the course intent are problem of kinetic theory, collisions and Boltzmann transport equation, equilibrium state of dilute gas, Boltzmann's H-theorem, Maxwell-Boltzmann distribution, method of most probable distribution, validity of Boltzmann transport equation, basic principles of classical statistical mechanics, equipartition theorem, classical ideal gases, Gibbs paradox, canonical and grand canonical ensembles, density matrix, meaning of Maxwell construction, microcanonical ensemble, derivation of thermodynamics, quantum statistical mechanics, postulates of quantum statistical mechanics, density matrix, ensembles in quantum statistical mechanics, third law of thermodynamics.
Course Learning Outcomes	1) Investigate reasons of macro cases in the micro structure of matter 2) Describe basic thermodynamic principles and statistical calculations of physical parameters of macroscopically systems 3) Identify postulates of quantum statistical mechanics 4) Explain the density matrix, the ensembles in quantum statistics and the third law of thermodynamics 5) Explain the basic information about statistical distributions and their applications

WEEKLY COURSE CONTENT

Week	Topics	Teaching and Learning Methods and Techniques	Study Materials
1. Week	Problem of kinetic theory	Lecture, Problem solving, Homework	
2. Week	Collisions and Boltzmann transport equation	Lecture, Problem solving, Homework	

Quick Access

Physics (Master)
- 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
- Assessment
- Course Category
- CONTRIBUTION OF COURSE LEARNING OUTCOMES TO PROGRAMME OUTCOMES
- ECTS credits and course workload

3. Week	Equilibrium state of dilute gas	Lecture, Problem solving, Homework	
4. Week	Boltzmann's H-theorem	Lecture, Problem solving, Homework	
5. Week	Maxwell-Boltzmann distribution, method of most probable distribution	Lecture, Problem solving, Homework	
6. Week	Validity of Boltzmann transport equation	Lecture, Problem solving, Homework	
7. Week	Basic principles of classical statistical mechanics	Lecture, Problem solving, Homework	
8. Week	Midterm Exam	Exam	
9. Week	Equipartition theorem, classical ideal gases, Gibbs paradox	Lecture, Problem solving, Homework	
10. Week	Canonical and grand canonical ensembles, density matrix	Lecture, Problem solving, Homework	
11. Week	Meaning of Maxwell construction	Lecture, Problem solving, Homework	
12. Week	Microcanonical ensemble, derivation of thermodynamics	Lecture, Problem solving, Homework	
13. Week	Quantum statistical mechanics	Lecture, Problem solving, Homework	
14. Week	Micro and grand canonical ensembles	Lecture, Problem solving, Homework	
15. Week	Postulates of quantum statistical mechanics, density matrix, ensembles in quantum statistical mechanics, third law of thermodynamics	Lecture, Problem solving, Homework	
16. Week	Final Exam	Exam	

RESOURCES

Recommended Sources
James P. Sethna, Statistical Mechanics: Entropy, Order Parameters and Complexity, 2009, Clarendon Press, OXFORD
R. K. Pathria, Statistical Mechanics, Butterworth-Heinemann, 1996
Stowe, K. (1984). Introduction to statistical mechanics and thermodynamics. New York: John Wiley and Sons Ltd.

ASSESSMENT

Measurement and Evaluation Methods and Techniques		
Mid-term exam + Assignment + Research & Project and Presentation 40%, Final Exam 60%		
In-Term Studies	**Quantity**	**Percentage**
Mid Term Exam 1	1	40
Total	1	40
End-Term Studies	**Quantity**	**Percentage**
Final Exam	1	60
Total	1	60
Contribution Of In-Term Studies To Overall Grade		40
End-Term Studies		60
Total		100

COURSE CATEGORY

Course Category	Percentage
Core Courses	% 100

CONTRIBUTION OF COURSE LEARNING OUTCOMES TO PROGRAMME OUTCOMES

Programme Outcomes	Contribution Level	DK1	DK2	DK3	DK4	DK5
PY1	4	4	4	4	4	4
PY2	4	4	4	4	4	4
PY3	4	4	4	4	4	4
PY4	4	4	4	4	4	4
PY5	2	2	2	2	2	2
PY6	4	4	4	4	4	4
PY7	3	3	3	3	3	3
PY8	0	0	0	0	0	0
PY9	3	3	3	3	3	3
PY10	0	0	0	0	0	0
PY11	0	0	0	0	0	0
PY12	0	0	0	0	0	0
PY13	3	3	3	3	3	3
PY14	3	3	3	3	3	3
PY15	0	0	0	0	0	0

*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)
Final Exam	1	3	3
Further Study	14	4	56
Mid Term Exam Preparation	1	15	15
Final Exam Preparation	1	22	22
Assignment 1	2	25	50
Mid Term Exam 1	1	3	3
Class Hours (14 weeks)	14	3	42
		Total Workload	191
		Total Workload / 25.5 (s)	7.49
		ECTS Credit of the Course	7