SEMESTER LEARNING ACTIVITY PLANS
(SLAP)
SEMESTER ODD/EVEN 2022/2023

Statistical Mechanics

MFF5051 / 3 Credits

Lecturer Coordinator:

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UNIVERSITAS GADJAH MADA
FACULTY OF MATHEMATICS AND NATURAL SCIENCE
2022

Universitas Gadjah Mada
Faculty of Mathematics and Natural Science
Physics Department / Study Program Master Physics
Semester Odd/Even 2022/2023

SEMESTER LEARNING ACTIVITY PLANS (SLAP)

Code	Course Name	Credits (credits)	Semester	Status	Prerequisite
MFF5051	*Statistical Mechanics*	*3*	*Odd/Even*	*Compulsory*	*None*

Short Description

Statistical Mechanics course is Compulsory course 3 credits (Theory) in the 2022 Curriculum Master Physics Study Program, Faculty of Mathematics and Natural Science UGM.

The syllabus of this course is as follows:
Basic statistical concepts, Binomial distribution, Maxwell-Boltzmann distribution, laws of thermodynamics, statistical calculations of thermodynamic quantities, fluctuations, phase spaces, partition functions, and their properties, microcanonical ensembles, canonical and microcanonical, equipartition theorem, Liouville's theorem, classical statistical constraints with quantum, Bose-Einstein statistics, Fermi-Dirac statistics, free electron theory of metals, kinetic theory of transport processes, Boltzmann transport equations, phase changes (classical and quantum).

The courses are held in class for 14 weeks, each week's session last for 3 x 50 minutes. Four weeks of course period is used for Midterm Exam and Final Exam, each held for two weeks as scheduled.

Student evaluation for course assessments is performed summative and formative. The summative evaluation is implemented as written exams, both Midterm and Final Exam, which take a maximum of 120 minutes. The formative evaluation is implemented as individual assignments for each student in the form of completing an assignment individually. Monitoring is carried out by observing student activities during the course, such as attendance, Q&A and discussion about the material presented, and student performance in completing individual assignments.

Program Learning Outcomes (PLO) Imposed on the Course

PLO 3	Mastering further knowledge of classical and modern physics theory, and its relationship with other disciplines, and has mastered an advanced field of physics specialization that allows him to keep up with the latest international research developments.
PLO 4	Mastering various mathematical disciplines related to an advanced field of physics, and able to develop physical models using various mathematical and computational tools with an inter or multidisciplinary approach to solving problems related to an advanced field of physics.
PLO 6	Able to apply knowledge to analyze, synthesize, formulate problems and solve problems comprehensively in one of advanced field of physics, through experimental or theoretical research, then be able to classify and draw conclusions about their findings for the development of science and technology.

Upon completion of this course, students should be able to:

Course Outcomes (CO)	***CO1***	Understand the concept of thermodynamics.		
	CO2	Understand the Concept of Phase Space.		
	CO3	Understand Various Statistical Mechanics Ensembles.		
	CO4	Understand the Concept of Quantum Statistics.		
	CO5	Understand the Simple Application of Quantum Statistics.		
	CO6			
	CO7			
	CO8			
The Correlation of CO to Learning Materials and Methods, and Time Allocation		**Learning Materials**	**Learning Methods**	**Time Allocation**
	CO1	Thermodynamics Concepts	Lecture	3 x 50 minutes
	CO1	Phase Space	Lecture	3 x 50 minutes
	CO1	Phase Space density	Lecture	3 x 50 minutes
	CO2	Ensemble Theory	Lecture	3 x 50 minutes
	CO2	Ensemble Theory	Lecture	3 x 50 minutes
	CO2	Ensemble Theory App	Lecture	3 x 50 minutes
	CO2	Ensemble Theory App	Lecture	3 x 50 minutes
	CO3	Quantum Statistics	Lecture	3 x 50 minutes
	CO3	Quantum Statistics	Lecture	3 x 50 minutes
	CO3	State Vector Symmetry	Lecture	3 x 50 minutes
	CO4	State Vector Symmetry	Lecture	3 x 50 minutes
	CO4	Quantum Ideal Gas System	Lecture	3 x 50 minutes
	CO4	Quantum Ideal Gas System	Lecture	3 x 50 minutes
	CO4	Quantum Ideal Gas System	Lecture	3 x 50 minutes
	Final Exam/ Project Task Results/ Case Analysis Results			
Learning Methods	Lecture			
Student Learning Experience	Learn to analyze and review: Thermodynamics Concepts, Phase Space, Phase Space density, Ensemble Theory, Ensemble Theory, Ensemble Theory App, Ensemble Theory App, Quantum Statistics, Quantum Statistics, State Vector Symmetry, State Vector Symmetry, Quantum Ideal Gas System, Quantum Ideal Gas System, Quantum Ideal Gas System.			
Access to Learning Media/ LMS	Textbooks, LCD displays, assignments on the website			

and Offline and Online Percentage	
Assessment Methods and Synchronization with CO	

Assessment Methods	**Assessment Percentage**	**Criteria/Indicators**	**CO1**	**CO2**	**CO3**	**CO4**
Participatory Activity*						
Project Results/ Case Study Results/ PBL Results*						
Cognitive						
Assignment	30%		7,5%	7,5%	7,5%	7,5%
Quiz						
Midterm Exam	35%		17,5%	17,5%		
Final Exam	35%				17,5%	17,5%

*) can also be obtained from the Midterm or Final Exam as the result of participatory activities or project/ case study results. According to IKU 7, the percentage of project results/ case study/ PBL results is at least 50%.

References	**Main references:** 1. W. Greiner, L. Neise, dan H. Stoecker, 1995, Thermodynamics and Statistical Mechanics, Springer. 2. K. Huang,1987, Statistical Mechanics, John Wiley and Sons. 3. Kittel, C dan Kroemer, H., 1980, Thermal Physics, McGraw-Hill. 4. Reif, F., 1965, Fundamentals of Statistical and Thermal Physics, W.H. Freeman & Co.
Lecturers (*Team Teaching*)	1. Mirza Satriawan, S.Si., M.Si., Ph.D. 2. 3. 4.

Authorization	**Date of Drafting**	**Lecturer Coordinator**	**Head of Curriculum Committee**	**Head of Study Program**
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