هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

Course Specifications

Course Title:	**Statistical Physics**
Course Code:	**2033204-3**
Program:	**Bachelor in Physics**
Department:	**Department of Physics**
College:	**College of Science**
Institution:	**Taif University**

Table of Contents

A. Course Identification

1. Credit hours:3
2. Course type **a.** University ☐ College ☐ Department ☑ Others ☐ **b.** Required ☑ Elective ☐
3. Level/year at which this course is offered: 9th Level/ 3th Year
4. Pre-requisites for this course (if any)**:Heat and Thermodynamic 2032101-3** **Mathematical Physics (1) 2033102-3**
5. Co-requisites for this course (if any)**: None**

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	4	100%
2	**Blended**	0	0%
3	**E-learning**	0	0%
4	**Distance learning**	0	0%
5	**Other**	0	0%

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	40
2	**Laboratory/Studio**	0
3	**Tutorial**	0
4	**Others** (specify)	0
	Total	**40**

B. Course Objectives and Learning Outcomes

1. Course Description

This course meets 2 times per week 2 for lecture. This course develops concepts in classical laws of thermodynamics, mainly for systems in thermal equilibrium. and some important applications. The course discusses how probability theory can be used to derive relations between the microscopic and macroscopic properties of matter. Numerous examples are used to illustrate a wide variety of physical phenomena such as thermodynamic potentials magnetism, ideal gas, thermal radiation, electrons in solids.

2. Course MainObjective

Studying of the physical properties of systems consisting of a very large number particles (atoms, molecules….). Examine the basic theories of statistical physics and apply them to a wide variety of interesting problems.

3. Course Learning Outcomes

	CLOs	AlignedPLOs
1	**Knowledge and Understanding**	
1.1	define the principals and scientific facts that are used during the course	K2
1.2	Report how to manipulate classical and quantum models using statistical physics rules	K2
2	**Skills :**	
2.1	Simplify problems and analyze phenomena	S1
2.2	Apply the theory on different types of gases: ideal classic, diatomic, quantum Fermi gases such as quarks, electrons Bose gases such as photons	S3
3	**Values:**	
3.1	Show responsibility for working independently and for continuous improvement of personal capacities.	V1

C. Course Content

No	List of Topics	Contact Hours
1	**Introduction** • The scope of statistical physics • The first, second, and third laws of thermodynamics • Thermodynamics potential • The thermodynamic properties of a system	5
2	**Introduction to probability** • Probability distribution of microstates in thermal equilibrium • The thermodynamic probability • From Microscopic To Macroscopic Behavior	5
3	**Maxwell- Boltzmann statistics:** • Distinguishable & indistinguishable particles • The statistical interpretation of entropy	5
4	**Partition Function and the Applications** • The monoatomic ideal gaz • The principle of equipartition of energy	5
5	**Maxwell Velocity Distribution** • The distribution of molecular velocity	3
6	**3- Bose- Einstein statistics:** • Bose- Einstein gas • Thermodynamic probability in Bose- Einstein • Black Body Radiation	5
7	**4- Fermi- Dirac statistics:** • Fermi gas • Thermodynamic probability in Fermi- Dirac statistics • Thermionic emission	5

8	**The specific heat capacity of solids** • Classical Model • Einstein's Model • Debye's Model	5
	Final Review	2
Total		**40**

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	TeachingStrategies	AssessmentMethods
1.0	**Knowledge and Understanding**		
1.1	define the principals and scientific facts that are used during the course	Lecture	Written exam and Homework reports
1.2	Report how to manipulate classical and quantum models using statistical physics rules	Lecture and Group discussion	Written exam
2.0	**Skills**		
2.1	Simplify problems and analyze phenomena,	Lectures	Written exam and Homework reports
2.2	Apply the theory on different types of gasses: ideal classic, diatomic, quantum Fermi gasses such as quarks, electrons Bose gases such as photons	Lecture and Group discussion	Homework reports
3.0	**Values**		
3.1	Show responsibility for working independently and for continuous improvement of personal capacities.	Group discussion	Homework reports

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Activities	Periodically	10%
2	Midterm exam	6th	30%
3	Short exam	9th	10%
4	Final exam	12th	50%

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :
6 Hours per week during office-hours, in teacher's staffroom or as per the arrangement made by the teacher

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	1- Huang, Kerson. *Statistical Mechanics*. Wiley, 1987. ISBN: 9780471815181. 2- Kardar, Mehran. *Statistical Physics of Particles*. Cambridge University Press, 2007. ISBN: 9780521873420.
Essential References Materials	1- Thermodynamic and statistical mechanicsBy: G Socrates ,Butterworths 1971. Statistical Mechanics, 3rd Ed., by Pathria and Beale 2011 Elsevier Ltd.
Electronic Materials	https://en.wikipedia.org/wiki/Statistical_physics
Other Learning Materials	None

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Lecture room with max 60 seats
Technology Resources (AV, data show, Smart Board, software, etc.)	data show, Smart Board
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	NON

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Student Feedback on Effectiveness of Teaching	Students	Indirect
Evaluation of Teaching	Pear reviewer Program coordinator Departmental council Faculty council	Indirect
Improvement of Teaching	Program coordinator Relevant committee	Direct
Quality of learning resources	Students Instructor Faculty	Indirect
Extent of achievement of course learning outcomes,	Program coordinator Instructor	Direct
Course effectiveness and planning for improvement	Program coordinator Instructor	Indirect

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes,Quality oflearning resources, etc.)
Evaluators (Students,Faculty, Program Leaders,Peer Reviewer, Others (specify)
Assessment Methods(Direct, Indirect)

H. Specification Approval Data

Council / Committee	Department Council
Reference No.	
Date	October 2, 2022