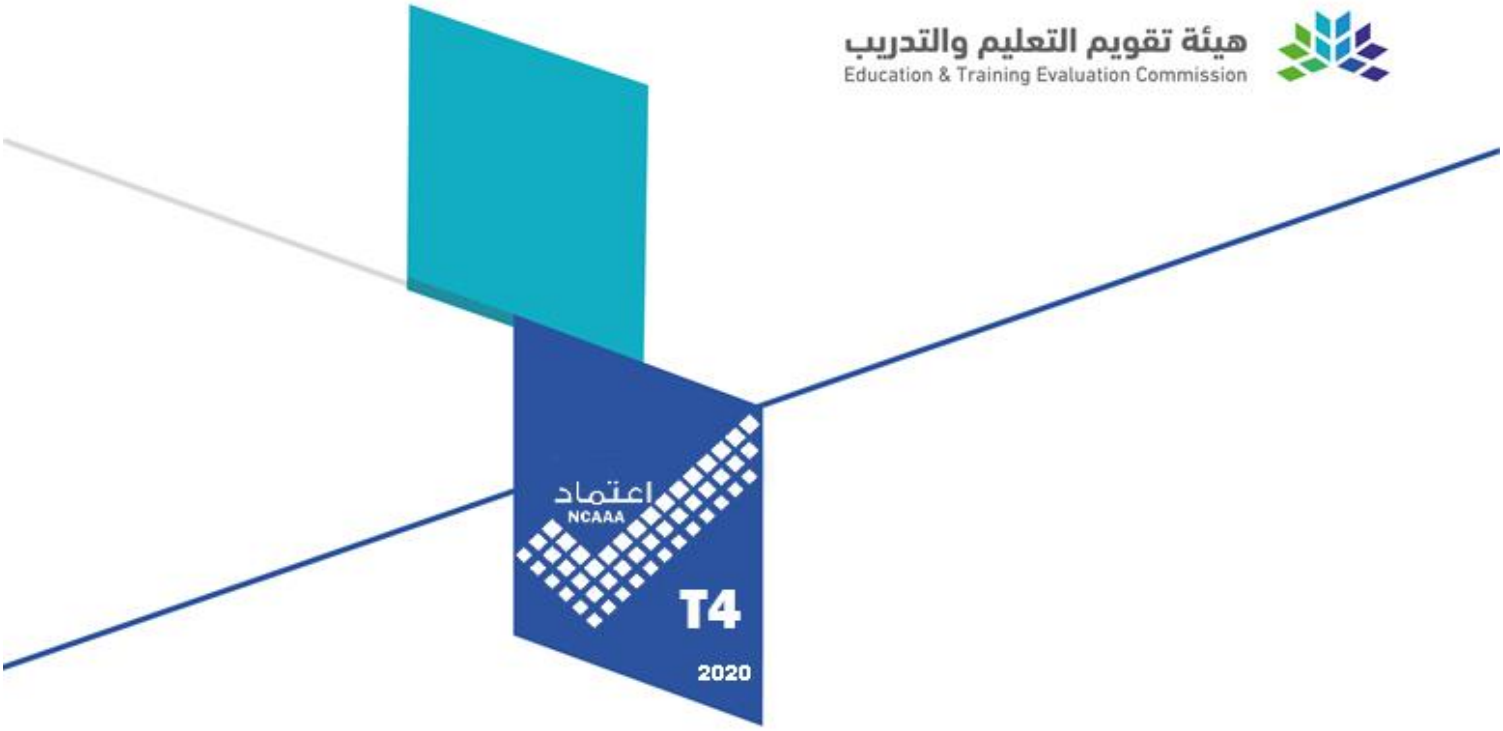
هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission



Course Specifications

Course Title:	**General Physics**
Course Code:	**PHY 1101**
Program:	**Bachelor of Science in Physics.** **Bachelor of Science in Applied Mathematics.** **Bachelor of Science in Chemistry.** **Bachelor of Science in Biology.**
Department:	**Physics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**

Table of Contents

A. Course Identification

1. Credit hours:	**5 (3 Lectures, 2 Lab, 2 Tutorial)**
2. Course type	
a.	University ☐ College ☑ Department ☐ Others ☐
b.	Required ☑ Elective ☐
3. Level/year at which this course is offered:	**Level 1/Year 1**
4.Pre-requisites for this course (if any)**:**	**None**
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**	**84**	**100%**
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	**36**
2	**Laboratory/Studio**	**24**
3	**Tutorial**	**24**
4	**Others** (specify)	**0**
	Total	**84**

B. Course Objectives and Learning Outcomes

1. Course Description

Physics 1101 is an introductory physics course for non-science majors. This course focuses on basic physics concepts and connections to everyday life. Course topics include Motion in one dimension, Vectors, laws of motion, Work and kinetic energy, Potential energy and conservation of energy. Overall goals of this course include students' gaining an appreciation for the physical world, improved critical thinking and reasoning skills, and improved scientific literacy for a better-informed public that can make intelligent voting decision. Furthermore, the course provides an introduction to laboratory techniques and experimental methods of physics with emphasis on linking the understanding of physics concepts with "Real-Life" situations. Every class will have a short lecture introducing the procedures, concepts, formulas and instructions relevant to the experiment. The lecture will also cover what is expected in the lab-report; don't be late. Attendance and participation is mandatory. Experiments will usually be performed in groups, but each student will turn in an individual lab report.

2. Course MainObjective

- **Provide the basic concepts and build a strong foundation in the principles of classical mechanics.**
- **Analyze different physical situations and phenomena in terms of the fundamental laws of classical mechanics.**
- **Understand how these principles are applied in the world around us.**
- **Gain an understanding of the classical laws of physics and how they are applied to real world problems.**
- **Observe and analyze physical data relevant to some of the experiments in Mechanics.**
- **Develop critical thinking and analytical problem-solving skills.**

3. Course Learning Outcomes

	CLOs After successful completion of the course, students will able to:	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	**Describe the concepts and principles in introductory study of physics.**	**K1, K2**
1.2	**Recognize the underlying physical principles behind various daily life phenomena.**	**K1, K2**
1.3	**Outline physical phenomena using proper physical laws and theories in mechanics.**	**K1, K2**
1.4	**Define simple mathematical techniques for quantitative analysis in solving physics problems.**	**K1, K2**
2	**Skills:**	
2.1	**Summarize the basic knowledge gained from studying mechanics.**	**S1, S2**
2.2	**Develop the students ability to solve and analyze problems in physics related the topics covered by the course.**	**S2, S3**
2.3	**Explain and use information from the output of experiment to draw conclusions.**	**S2; S3**
2.4	**Summarize conclusions and write reports.**	**S3; S4**
2.5	**Communicate in a clear and concise manner orally, and using IT for acquiring and analyzing information.**	**S4, S5**
3	**Values:**	
3.1	**Show the collaboration and inter-professionalism in class discussions or team works, as well as solve problems independently.**	**V1, V2, V3**

C. Course Content

No	List of Topics	Contact Hours
1	**Motion in one dimension:** Displacement, velocity and acceleration, one dimensional motion with constant acceleration, freely falling objects.	**13**
2	**Vectors:** Vector and scalar quantities, some properties of vectors, components of a vector and unit vectors	**8**
3	**The laws of motion:** The concept of force, Newton's first law, Newton's second law, the force of gravity and weight, Newton's third law, some	**13**

	applications of Newton's laws, forces of friction.	
4	**Work and kinetic energy:** The scalar product of two vectors, work done bya constant force, kinetic energy and the work-kinetic energy theorem.	**13**
5	**Potential energy and conservation of energy:** Potential energy, conservative and non conservative forces, conservative forces and potential energy, conservation of mechanical energy, work done by non-conservative forces, Power.	**13**
List of Topics *(Laboratory)*		
1	**Introduction**	**2**
2	**Experiment 1:** Measurements and uncertainties. Virtual experience.	**2**
3	**Experiment 2:** Free fall.	**2**
4	**Experiment 3:** Forces in equilibrium.	**2**
5	**Experiment 4:** Simple pendulum.	**2**
6	**Experiment 5:** Constant Spring.	**2**
7	**Experiment 6:** Simple harmonic motion.	**2**
8	**Experiment 7:** Free fall: Conservation of mechanical energy of a uniformly accelerated mass.	**2**
9	**Experiment 8:** Describe the movement of an object moving at a constant speed and constant acceleration.	**2**
10	**Experiment 9:** Friction and Newton's second law.	**2**
11	**Experiment 10:** Ohm's Law.	**2**
12	**Revision**	**2**
Total		**84**

Lab. content

D. Teaching and Assessment

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

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	**Describe the concepts and principles in introductory study of physics.**	• Lectures. • Tutorials. • Class discussions.	▪ Exams. ▪ Participation. ▪ Discussions.
1.2	**Recognize the underlying physical principles behind various daily life phenomena.**	• Lectures. • Tutorials. • Class discussions.	▪ Exams. ▪ Homework. ▪ Quizzes.
1.3	**Outline physical phenomena using proper physical laws and theories in mechanics.**	• Lectures. • Class discussions. • Tutorials.	▪ Participation. ▪ Exams. ▪ Discussions. ▪ Homework.
1.4	**Define simple mathematical techniques for quantitative analysis in solving physics problems.**	• Lectures. • Class discussions. • Tutorials.	▪ Participation. ▪ Exams. ▪ Discussions. ▪ Homework.
2.0	**Skills**		
2.1	**Summarize the basic knowledge gained from studying mechanics.**	• Lectures. • Class discussions. • Tutorials.	▪ Exams. ▪ Discussions. ▪ Participation.
2.2	**Develop the students ability**	• Problem classes and group tutorial.	▪ Exams. ▪ Discussions.

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
	to solve and analyze problems in physics related the topics covered by the course.	• Homework assignments as well as problems solutions.	▪ Homework.
2.3	**Explain and use information from the output of experiment to draw conclusions.**	• Experiments setting up, data recording and calculations based on lab manual and lectures (co-requisites).	▪ Compare with standard results. ▪ Feedback and explanations.
2.4	**Summarize conclusions and write reports.**	• Experiments setting up, data recording and calculations based on lab manual and lectures (co-requisites).	▪ Compare with standard results. ▪ Feedback and explanations.
2.5	**Communicate in a clear and concise manner orally, and using IT for acquiring and analyzing information.**	• Lectures. • Class discussions. • Tutorials. • Encourage students to use electronic mail and internal network for submitting homework and assignments. • Use digital library.	▪ Exams. ▪ Participation and activities of students in the course community and blackboard. ▪ Homework.
3.0	**Values**		
3.1	**Show the collaboration and inter-professionalism in class discussions or team works, as well as solve problems independently.**	• Small team tasks • Open discussion at classroom. • Office hours.	▪ Participation. ▪ Homework. ▪ Mini-project(s).

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	**Class Activities (class quizzes, homework, solving problems, etc.....)**	**weekly**	**10 %**
2	**Laboratory**	**All the semester**	**30 %**
3	**Midterm Exam 1**	**5thweek**	**10 %**
4	**Midterm Exam 2**	**9thweek**	**10 %**
5	**Final Exam**	**13thweek**	**40 %**

***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 :

- **Students will be assigned an academic advisor to give them the appropriate academic counseling and support.**
- **The lecturer will allocate 6 office hours per week. The assigned times will be advertised on the office door and reserved by the instructor as part of his teaching schedule.**
- **Students are able to get individual consultation appointment with teaching staff via email, phone calls and department website.**

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	Serway R.A. and Jewett J.W., ***Physics for Scientists and Engineers with Modern Physics,*** 9th Edition, Brooks/Cole, Belmont, CA, USA (2014).
Essential References Materials	Halliday D. and Resnick R., ***Physics***, 9thEdition, John Wiley and sons (2011).
Electronic Materials	**https://units.imamu.edu.sa/colleges/en/science/Pages/default.aspx**
Other Learning Materials	- Laboratory Manual supplied by the Department of Physics. - Laboratory Manual is available at the website of the Department of Physics.

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	• **Each of the class room should be equipped with a whiteboard and a projector.**
Technology Resources (AV, data show, Smart Board, software, etc.)	• **Classrooms are equipped with data show and Smart Board.**
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	**See attached file**

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment, Quality of learning resources	• **Students** • **Second assessor**	**During the semester and at the end of the course each student will complete two evaluation forms.**
Extent of achievement of course learning outcomes, Quality of learning resources	• **Instructor** • **Second assessor**	**At the end of each semester the course instructor should complete the course report, including a summary of student questionnaire responses appraising progress and identifying changes that need to be made if necessary.**

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	Quality Unit-Physics Department
Reference No.	Department council No. 11
Date	16/11/2022

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد NCAAA T4 2020

Course Specifications

Course Title:	**Classical Mechanics (1)**
Course Code:	**PHY 1105**
Program:	**Bachelor of Science in Physics**
Department:	**Physics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**

Table of Contents

A. Course Identification

1. Credit hours:	**5 (4 Lectures, 0 Lab, 2 Tutorial)**
2. Course type	
a.	University ☐ College ☐ Department ☑ Others ☐
b.	Required ☑ Elective ☐
3. Level/year at which this course is offered:	**Level 2/Year 1**
4.Pre-requisites for this course (if any)**:**	**General Physics (1), PHY 1101 and Calculus (1), MAT 1101.**
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**	**72**	**100%**
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	**48**
2	**Laboratory/Studio**	**0**
3	**Tutorial**	**24**
4	**Others** (specify)	**0**
	Total	**72**

B. Course Objectives and Learning Outcomes

1. Course Description

This course focuses on basic physics concepts and connections to everyday life. Course topics include linear momentum and collisions, Rotation of a rigid object about a fixed Axis, Angular momentum, Static equilibrium, Universal gravitation, and oscillatory motion. Connections to everyday life and society. While advanced mathematics is not required for this course, basic math with some trigonometry and simple algebra is utilized. Overall goals of this course include students' gaining an appreciation for the physical world, improved critical thinking and reasoning skills.

2. Course Main Objective

- **Learn and understand the basic knowledge of Newton's equation of motion, dynamics of a system of particles, the motion in linear and circular motions.**
- **Describe the concept of momentum in both linear and circular motions.**
- **Understand the basic concepts of the gravitational force and associated law.**
- **Understand the nature and causes of oscillations and the dynamics of a system of particles.**
- **Demonstrate competence with a wide variety of classical mechanics laws and techniques.**

3. Course Learning Outcomes

	CLOs After successful completion of the course, students will able to:	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	**Describe the behavior of systems in linear and rotational motions.**	**K1, K2**
1.2	**Outline the concepts of the linear, angular momentum and Kepler's laws.**	**K1, K2**
1.3	**State the basic knowledge of gravitational force, potential and associated law.**	**K1, K2**
1.4	**Understand the nature and causes of oscillations.**	**K1, K2**
2	**Skills:**	
2.1	**Explain the basic knowledge gained from studying classical mechanics.**	**S1, S2**
2.2	**Develop the student's ability to solve and analyze problems in physics related the topics covered by the course.**	**S2, S3**
2.3	**Communicate in a clear and concise manner orally, and using IT for acquiring and analyzing information.**	**S4, S5**
3	**Values:**	
3.1	**Show the collaboration and inter-professionalism in class discussions or team works, as well as solve problems independently.**	**V1, V2**

C. Course Content

No	List of Topics	Contact Hours
1	**Linear Momentum and Collisions:** Linear momentum and its conservation, impulse and momentum, collisions in one-dimension, two-dimensional collisions, the center of mass, motion of a system of particles.	**12**
2	**Rotation of a Rigid Object about a Fixed Axis:** Angular position, velocity and acceleration, rotational kinematics (rotational motion with constant angular acceleration), angular and linear quantities, rotational kinetic energy, calculation of moments of inertia, torque, relationship between torque and angular acceleration, work and energy in rotational motion.	**16**
3	**Angular Momentum:** The vector product and torque, angular momentum, angular momentum of a rotating rigid object, conservation of angular momentum.	**10**
4	**Static Equilibrium:** The conditions of equilibrium, more on the center of	**10**

	gravity, examples of rigid objects in static equilibrium.	
5	**Universal Gravitation:** Newton's law of universal gravitation. Free-fall acceleration and the gravitational force, Kepler's laws and the motion of planets, gravitational potential energy, energy considerations in planetary and satellite motion.	**12**
6	**Oscillatory Motion:** Motion of an object attached to a spring, mathematical representation of simple harmonic motion, energy of the simple harmonic motion, the pendulum, damped oscillations, forced oscillations.	**12**
Total		**72**

D. Teaching and Assessment

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

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	**Describe the behavior of systems in linear and rotational motions.**	• Lectures. • Tutorials. • Class discussions.	▪ Exams. ▪ Participation. ▪ Discussions.
1.2	**Outline the concepts of the linear, angular momentum and Kepler's laws.**	• Lectures. • Tutorials. • Class discussions.	▪ Exams. ▪ Homework's. ▪ Quizzes.
1.3	**State the basic knowledge of gravitational force, potential and associated law.**	• Lectures. • Class discussions. • Tutorials.	▪ Participation. ▪ Exams. ▪ Discussions. ▪ Homework's.
1.4	**Understand the nature and causes of oscillations.**	• Lectures. • Class discussions. • Tutorials.	▪ Participation. ▪ Exams. ▪ Discussions. ▪ Homeworks.
2.0	**Skills**		
2.1	**Explain and summarize the basic knowledge gained from studying classical mechanics.**	• Lectures. • Class discussions. • Tutorials.	▪ Exams. ▪ Discussions. ▪ Participation.
2.2	**Develop the students ability to solve and analyze problems in physics related the topics covered by the course.**	• Problem classes and group tutorial. • Homework assignments as well as problems solutions.	▪ Exams. ▪ Discussions. ▪ Homeworks.
2.3	**Communicate in a clear and concise manner orally, and using IT for acquiring and analyzing information.**	• Lectures. • Class discussions. • Tutorials. • Encourage students to use electronic mail and internal network for submitting homework and assignments. • Use digital library.	▪ Exams. ▪ Participation and activities of students in the course community and blackboard. ▪ Homeworks.
3.0	**Values**		
3.1	**Show the collaboration and**	• Small team tasks	▪ Participation

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
	inter-professionalism in class discussions or team works, as well as solve problems independently.	• Open discussion at classroom. • Office hours.	• Homeworks • Mini-project(s).

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	**Class Activities (class quizzes, homework, solving problems, etc.....)**	**weekly**	**10 %**
2	**Midterm Exam 1**	**5thweek**	**25 %**
3	**Midterm Exam 2**	**9thweek**	**25 %**
4	**Final Exam**	**13thweek**	**40 %**

***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 :

- **Students will be assigned an academic advisor to give them the appropriate academic counseling and support.**
- **The lecturer will allocate 6 office hours per week. The assigned times will be advertised on the office door and reserved by the instructor as part of his teaching schedule.**
- **Students are able to get individual consultation appointment with teaching staff via email, phone calls and department website.**

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	Serway R.A. and Jewett J.W., ***Physics for Scientists and Engineers with Modern Physics,*** 9th Edition, Brooks/Cole, Belmont, CA, USA (2014).
Essential References Materials	Halliday D. and Resnick R., ***Physics,*** 9thEdition, John wiley& sons (2011).
Electronic Materials	**https://units.imamu.edu.sa/colleges/en/science/Pages/default.aspx**
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	• **Each of the class room should be equipped with a whiteboard and a projector.**

Item	Resources
Technology Resources (AV, data show, Smart Board, software, etc.)	• **Classrooms are equipped with data show and Smart Board.**
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment, Quality of learning resources	• **Students** • **Second assessor**	**During the semester and at the end of the course each student will complete two evaluation forms.**
Extent of achievement of course learning outcomes, Quality of learning resources	• **Instructor** • **Second assessor**	**At the end of each semester the course instructor should complete the course report, including a summary of student questionnaire responses appraising progress and identifying changes that need to be made if necessary.**

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	**Quality Unit-Physics Department**
Reference No.	**Department council No. 11**
Date	**16/11/2022**

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد NCAAA T4 2020

Course Specifications

Course Title:	**Electricity and Magnetism**
Course Code:	**PHY 1121**
Program:	**Bachelor of Science in Physics**
Department:	**Physics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**

Table of Contents

A. Course Identification

1. Credit hours:	**5 (4 Lectures, 0 Lab, 2 Tutorial)**
2. Course type	
a.	University ☐ College ☐ Department ☑ Others ☐
b.	Required ☑ Elective ☐
3. Level/year at which this course is offered:	**Level 3/Year 1**
4.Pre-requisites for this course (if any)**:**	**General Physics (1), PHY 1101 and Calculus (2), MAT 1102**
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	72	100%
2	Blended		
3	E-learning		
4	Distance learning		
5	Other		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	48
2	Laboratory/Studio	0
3	Tutorial	24
4	Others (specify)	0
	Total	72

B. Course Objectives and Learning Outcomes

1. Course Description

This course covers the foundation of electricity and magnetism. In this course, students will develop solid and systematic problem-solving skills, and to lay the foundations for further studies in physics. It begins with electric fields, Gauss' law, electric potential. Capacitance and dielectrics are introduced, and then the course moves to the magnetic field, faraday's law, inductance, alternating current circuits. This course is designed to provide students with a working knowledge of the elementary physics principles mentioned above, as well as their applications, and to enhance their conceptual understanding of physical laws.

2. Course Main Objective

- **Provide the basic concepts and build a strong foundation in the principles of electricity and magnetism.**
- **Analyze different physical situations and phenomena in terms of the fundamental laws of electricity and magnetism.**
- **Understand how these principles are applied in the world around us.**
- **Demonstrate competence with a wide variety of mathematical tools and techniques.**

3. Course Learning Outcomes

CLOs After successful completion of the course, students will able to:		Aligned PLOs
1	**Knowledge and Understanding**	
1.1	**Describe the basic knowledge of the electricity and magnetism.**	**K1, K2**
1.2	**Outline the concepts of Faraday's law and inductance.**	**K1, K2**
1.3	**State the basic understanding of the alternating current circuits.**	**K1, K2**
2	**Skills:**	
2.1	**Explain and summarize the basic knowledge gained from studying Electricity and Magnetism course.**	**S1, S2**
2.2	**Develop the student's ability to solve and analyze problems in physics related the topics covered by the course.**	**S2, S3**
2.3	**Communicate in a clear and concise manner orally, and using IT for acquiring and analyzing information.**	**S4, S5**
3	**Values:**	
3.1	**Show the collaboration and inter-professionalism in class discussions or team works, as well as solve problems independently.**	**V1, V2,V3**

C. Course Content

No	List of Topics	Contact Hours
1	**Electric Fields:** Electric charges, Coulomb's law, the electric field, electric field of a continuous charge distribution, motion of charged particles in a uniform electric field.	**10**
2	**Gauss's Law:** electric field lines, electric flux, Gauss's law, application of Gauss's law to various charge distributions, conductors in electrostatic equilibrium.	**8**
3	**Electric Potential:** Potential energy and electric potential, electric potential difference in a uniform electric field, electric potential due to point charges, obtaining the value of the electric field from the electric potential, electric potential due to continuous charge distributions, electric potential due to charged conductor, application of electrostatics.	**10**
4	**Capacitance and dielectrics:** Definition of capacitance, calculating capacitance for parallel plate capacitors, connection of capacitors, energy stored in a charged capacitor, capacitors with dielectrics, RC circuits.	**8**
5	**Sources of the Magnetic Field:** The Biot-Savart's law, the magnetic force between two parallel conductors, Ampere's law, the magnetic field of a	**10**

	solenoid, magnetic flux, Gauss's law in magnetism, displacement current and the generalized Ampere's law.	
6	**Faraday's law:** Faraday's law of induction, motional emf, Lenz's law, induced emfs and electric fields, generators and motors, Eddy currents.	**8**
7	**Inductance:** Self-inductance, RL circuits, energy in a magnetic field, mutual inductance, oscillation in an LC circuit, the RLC circuit.	**8**
8	**Alternating Current Circuits:** AC sources, Resistors in an AC circuit, Inductors in an AC circuit, Capacitors in an AC circuit, the RLC series circuit, Power in an AC circuit, resonance in a series RLC circuit, the transformer.	**8**
Total		**72**

D. Teaching and Assessment

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

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	**Describe the basic knowledge of the electricity and magnetism.**	• Lectures. • Tutorials. • Class discussions.	▪ Exams. ▪ Participation. ▪ Discussions.
1.2	**State the basic understanding of the alternating current circuits.**	• Lectures. • Tutorials. • Class discussions.	▪ Exams. ▪ Homework. ▪ Quizzes.
1.3	**Outline the concepts of Faraday's law and inductance.**	• Lectures. • Class discussions. • Tutorials.	▪ Participation. ▪ Exams. ▪ Discussions. ▪ Homework.
2.0	**Skills**		
2.1	**Explain and summarize the basic knowledge gained from studying Electricity and Magnetism course**	• Lectures. • Class discussions. • Tutorials.	▪ Exams. ▪ Discussions. ▪ Participation.
2.2	**Develop the student's ability to solve and analyze problems in physics related the topics covered by the course.**	• Problem classes and group tutorial. • Homework assignments as well as problems solutions.	▪ Exams. ▪ Discussions. ▪ Homework.
2.3	**Communicate in a clear and concise manner orally, and using IT for acquiring and analyzing information.**	• Lectures. • Class discussions. • Tutorials. • Encourage students to use electronic mail and internal network for submitting homework and assignments. • Use digital library.	▪ Exams. ▪ Participation and activities of students in the course community and blackboard. ▪ Homework.
3.0	**Values**		
3.1	**Show the collaboration and inter-professionalism in class discussions or team works, as well as solve problems independently.**	• Small team tasks • Open discussion at classroom. • Office hours.	▪ Participation. ▪ Homework. ▪ Mini-project(s).

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Class Activities (class quizzes, homework, solving problems, etc.....)	weekly	10 %
2	Midterm Exam 1	5thweek	25 %
3	Midterm Exam 2	9thweek	25 %
4	Final Exam	13thweek	40 %

***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:

- **Students will be assigned an academic advisor to give them the appropriate academic counseling and support.**
- **The lecturer will allocate 6 office hours per week. The assigned times will be advertised on the office door and reserved by the instructor as part of his teaching schedule.**
- **Students are able to get individual consultation appointment with teaching staff via email, phone calls and department website.**

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	- Serway R.A. and Jewett J.W., ***Physics for Scientists and Engineers with Modern Physics,*** 9th Edition, Brooks/Cole, Belmont, CA, USA (2014).
Essential References Materials	- Halliday D. and Resnick R., ***Physics***, 9thEdition, John Wiley and sons (2011).
Electronic Materials	**https://units.imamu.edu.sa/colleges/en/science/Pages/default.aspx**
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	• **Each of the class room should be equipped with a whiteboard and a projector.**
Technology Resources (AV, data show, Smart Board, software, etc.)	• **Classrooms are equipped with data show and Smart Board.**
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment, Quality of learning resources	• Students • Second assessor	During the semester and at the end of the course each student will complete two evaluation forms.
Extent of achievement of course learning outcomes, Quality of learning resources	• Instructor • Second assessor	At the end of each semester the course instructor should complete the course report, including a summary of student questionnaire responses appraising progress and identifying changes that need to be made if necessary.

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

H. Specification Approval Data

Council / Committee	Quality Unit-Physics Department
Reference No.	Department council No. 11
Date	16/11/2022

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد NCAAA T4 2020

Course Specifications

Course Title:	**Waves & Optics**
Course Code:	**PHY 1240**
Program:	**Bachelor of Science in Physics**
Department:	**Physics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**

Table of Contents

A. Course Identification

1. Credit hours:	**5 (4 Lectures, 0 Lab, 2 Tutorial)**
2. Course type	
a.	University ☐ College ☐ Department ☑ Others ☐
b.	Required ☑ Elective ☐
3. Level/year at which this course is offered:	**Level 4/Year 2**
4.Pre-requisites for this course (if any)**:**	**Classical Mechanics (1), PHY 1105 and Calculus (2), MAT 1102**
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**	**72**	**100%**
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	**48**
2	**Laboratory/Studio**	**0**
3	**Tutorial**	**24**
4	**Others** (specify)	**0**
	Total	**72**

B. Course Objectives and Learning Outcomes

1. Course Description

This course is an introduction to waves and optics associated with physical phenomena. It is designed to analyze various situations or phenomena associated with waves, optics and modern physics using basic principles. Topics covered in waves and geometrical optics include: The Laws of geometric optics and image formation, Interference of light waves, diffraction patterns and polarization, Wave motion, Sound waves, Superposition and standing waves.

2. Course Main Objective

- **Analyze various situations or phenomena associated with waves and optics.**
- **Understand the laws of geometrical optics.**
- **Apply the characteristics of waves to light phenomena.**
- **Provide the fundamental concepts of wave motion, sound waves, waves interference, and superposition of standing waves.**
- **Develop critical thinking and analytical problem-solving skills.**

3. Course Learning Outcomes

CLOs After successful completion of the course, students will able to:		Aligned PLOs
1	**Knowledge and Understanding**	
1.1	State the physical principles that describe waves and geometrical optics.	K1, K2
1.2	Describe the wave propagation of light, interference, diffraction, polarization of light waves, and electromagnetic nature of light.	K1, K2
1.3	Outline the laws of refraction and reflection, and describe the principles of some optical instruments.	K1, K2
2	**Skills:**	
2.1	Explain and summarize the basic knowledge gained from studying waves and optical physics.	S1, S2
2.2	Develop the students ability to solve and analyze problems in physics related the topics covered by the course.	S2, S3
2.3	Communicate in a clear and concise manner orally, and using IT for acquiring and analyzing information.	S4, S5
3	**Values:**	
3.1	Show the collaboration and inter-professionalism in class discussions or team works, as well as solve problems independently.	V1, V2, V3

C. Course Content

No	List of Topics	Contact Hours
1	**The Laws of Geometric Optics and Image Formation:** Reflection, Refraction, Dispersion and prism, Total internal reflection, Images formed by flat mirror, Images formed by spherical mirrors, Images formed by refraction, Thin lenses.	16
2	**Interference of Light Waves:** Conditions for interference, Young's double-slit experiment, Intensity distribution of the double-slit interference pattern, Change of phase due to reflection, Interference in thin films.	16
3	**Diffraction Patterns and Polarization:** Introduction to diffraction patterns, Diffraction patterns from narrow slits, Resolution of single-slit and circular apertures, The diffraction grating, Polarization of light waves.	16
4	**Wave Motion:** Propagation of a disturbance, Sinusoidal waves, The Speed of waves on strings, Reflection and transmission, Rate of energy transfer by sinusoidal waves on strings, The linear wave equation.	14
5	**Sound Waves:** Speed of sound waves, Periodic sound waves, Intensity of periodic sound waves, The Doppler effect.	10
Total		72

D. Teaching and Assessment

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

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	**State the physical principles that describe waves and geometrical optics.**	• Lectures. • Tutorials. • Class discussions.	▪ Exams. ▪ Participation. ▪ Discussions.
1.2	**Describethe wave propagation of light, interference, diffraction, polarization of light waves, and electromagnetic nature of light.**	• Lectures. • Tutorials. • Class discussions.	▪ Exams. ▪ Homework. ▪ Quizzes.
1.3	**Outline the laws of refraction and reflection, and describe the principles of some optical instruments**	• Lectures. • Class discussions. • Tutorials.	▪ Participation. ▪ Exams. ▪ Discussions. ▪ Homework.
2.0	**Skills**		
2.1	**Explain and summarize the basic knowledge gained from studying waves and optical physics.**	• Lectures. • Class discussions. • Tutorials.	▪ Exams. ▪ Discussions. ▪ Participation.
2.2	**Develop the students ability to solve and analyze problems in physics related the topics covered by the course.**	• Problem classes and group tutorial. • Homework assignments as well as problems solutions.	▪ Exams. ▪ Discussions. ▪ Homework.
2.3	**Communicate in a clear and concise manner orally, and using IT for acquiring and analyzing information.**	• Lectures. • Class discussions. • Tutorials. • Encourage students to use electronic mail and internal network for submitting homework and assignments. • Use digital library.	▪ Exams. ▪ Participation and activities of students in the course community and blackboard. ▪ Homework.
3.0	**Values**		
3.1	**Show the collaboration and inter-professionalism in class discussions or team works, as well as solve problems independently.**	• Small team tasks • Open discussion at classroom. • Office hours.	▪ Participation ▪ Homework's ▪ Mini-project(s).

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	**Class Activities (class quizzes, homework, solving problems, etc.....)**	**weekly**	**10 %**
2	**Midterm Exam 1**	**5thweek**	**25 %**
3	**Midterm Exam 2**	**9thweek**	**25 %**
4	**Final Exam**	**13thweek**	**40 %**

***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 :

- **Students will be assigned an academic advisor to give them the appropriate academic counseling and support.**
- **The lecturer will allocate 6 office hours per week. The assigned times will be advertised on the office door and reserved by the instructor as part of his teaching schedule.**
- **Students are able to get individual consultation appointment with teaching staff via email, phone calls and department website.**

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	Raymond A. Serway, and John W. Jewett, ***Physics for Scientists and Engineers (with modern physics)*** – Brooks Cole – 8th Edition (July 21, 2003)
Essential References Materials	- Jenkins F.A. and White H.E., ***Fundamentals of Optics,*** 4th edition, McGraw-Hill (2001). - Hecht E., ***Optics,*** 4th Edition, Addison-Wesley (2004).
Electronic Materials	**https://units.imamu.edu.sa/colleges/en/science/Pages/default.aspx**
Other Learning Materials	**Multimedia associated with the text book and the relevant websites.**

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	• **Each of the class room should be equipped with a whiteboard and a projector.**
Technology Resources (AV, data show, Smart Board, software, etc.)	• **Classroomsare equipped with data show and Smart Board.**
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment, Quality of learning resources.	• **Students** • **Second assessor**	**During the semester and at the end of the course each student will complete two evaluation forms.**
Extent of achievement of course learning.	• **Instructor** • **Second assessor**	**At the end of each semester the course instructor should complete**

Evaluation Areas/Issues	Evaluators	Evaluation Methods
outcomes, Quality of learning resources		the course report, including a summary of student questionnaire responses appraising progress and identifying changes that need to be made if necessary.

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

H. Specification Approval Data

Council / Committee	Quality Unit-Physics Department
Reference No.	Department council No. 11
Date	16/11/2022

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد NCAAA T4 2020

Course Specifications

Course Title:	**Electromagnetism Laboratory**
Course Code:	**PHY 1281**
Program:	**Bachelor of Science in Physics**
Department:	**Physics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**

Table of Contents

A. Course Identification

1. Credit hours:	**2 (0 Lectures, 2 Lab, 2 Tutorial)**
2. Course type	
a.	University ☐ College ☐ Department ☑ Others ☐
b.	Required ☑ Elective ☐
3. Level/year at which this course is offered:	**Level 4/Year 2**
4.Pre-requisites for this course (if any)**:**	**Electricity & Magnetism, PHY 1121**
5. Co-requisites for this course (if any)**:**	

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	**48**	**100%**
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	**0**
2	**Laboratory/Studio**	**24**
3	**Tutorial**	**24**
4	**Others** (specify)	**0**
	Total	**48**

B. Course Objectives and Learning Outcomes

1. Course Description

This course is designed to aid students in the development of core practical skills in Physics. The course includes a series of experiments exploring fundamental concepts in thermal physics and mechanics. Every class will have a short lecture introducing the procedures, concepts, formulas and instructions relevant to the experiment. The lecture will also cover what is expected in the lab-report; don't be late. Attendance and participation is mandatory. Experiments will usually be performed in groups, but each student will turn in an individual lab report.

2. Course Main Objective

- **Observe and analyze physical data relevant to some of the experiments in thermal physics and mechanics.**
- **Provide students with a thorough understanding of the basic concepts of physics and the methods scientists use to explore natural phenomena, including observation, hypothesis development, measurement and data collection, experimentation, evaluation of evidence, and employment of mathematical analysis.**
- **Develop the student's mathematical ability to manipulate formulae and derive correct numerical solutions that can be measured in the real world.**
- **Instruct students in the competent use of laboratory equipment to collect and record data, apply relevant mathematical models and perform required computations, and present the derived results as an application of a measured observation of the physical world.**

3. Course Learning Outcomes

CLOs After successful completion of the course, students will able to:		Aligned PLOs
1	**Knowledge and Understanding**	
1.1	**Recognize the scientific method of inquiry to draw conclusions based on verifiable evidence such as expansion of solids and liquids.**	**K1;K2**
1.2	**Describe the theoretical bases of specific heat of solids, specific vaporization heat of liquids and latent heat of solids experiments.**	**K1;K2**
1.3	**Outline the concepts of experiments in thermal Physics and mechanics.**	**K1;K2**
2	**Skills:**	
2.1	**Analyze experiments according to the plan besides the learning from lab lecture.**	**S1; S2**
2.2	**Explain and use information from the output of experiment to draw conclusions.**	**S2; S3**
2.3	**Summarize conclusions and write reports.**	**S3; S4**
2.4	**Communicate in a clear and concise manner orally, and using IT for acquiring and analyzing information.**	**S4; S5**
3	**Values:**	
3.1	**Show the collaboration and inter-professionalism in class discussions or team works, as well as solve problems independently.**	**V1; V2; V3**

C. Course Content

No	List of Topics	Contact Hours
1	**Experiment 1:** Inscription in the lab and distribution of the group.	**4**
2	**Experiment 2:** Path-time diagrams of rotational motion: Measurements the angular velocity, angular acceleration.	**4**
3	**Experiment 3:** Conservation of Energy by using Maxwell's Wheel.	**4**
4	**Experiment 4:** Laws of Gyroscopes / 3-axis gyroscope.	**4**
5	**Experiment 5:** Damped and Forced Oscillations – Pohl's Torsional Pendulum: part 1.	**4**

6	**Experiment 6:** Damped and Forced Oscillations – Pohl's Torsional Pendulum: part 2.	**4**
7	**Experiment 7:** Determining the Specific Heat Capacity of Solids.	**4**
8	**Experiment 8:** The thermal expansion of solid bodies : Measuring the linear thermal expansion.	**4**
9	**Experiment 9:** Boyle s law: verification of Boyle s law , and measuring the atmospheric pressure.	**4**
10	**Experiment 10:** Determining the volumetric expansion coefficient of water as liquid.	**4**
11	**Experiment 11:**The latent heat of water	**4**
12	**Revision**	**4**
Total		**48**

D. Teaching and Assessment

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

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	**Recognize the scientific method of inquiry to draw conclusions based on verifiable evidence such as expansion of solids and liquids.**	• Supervision by lab instructor • Submitting an individual lab report. • Performing lab. experiments at the scheduled times.	▪ Participation. ▪ Report evaluation. ▪ Lab experiment check. ▪ Exams.
1.2	**Describe the theoretical bases of specific heat of solids, specific vaporization heat of liquids and latent heat of solids experiments.**	• Supervision by lab instructor • Submitting an individual lab report. • Performing lab. experiments at the scheduled times.	▪ Discussion. ▪ Report evaluation. ▪ Lab experiment check. ▪ Exams.
1.3	**Outline the concepts of experiments in thermal Physics and mechanics.**	• Supervision by lab instructor • Submitting an individual lab report. • Performing lab. experiments at the scheduled times.	▪ Participation. ▪ Report evaluation. ▪ Lab experiment check. ▪ Exams.
2.0	**Skills**		
2.1	**Analyze experiments according to the plan besides the learning from lab lecture.**	• Using the multimedia and visual materials, Lab manual and the theoretical bases of the course. • Interaction between students in the lab course community and discussions in the lab.	▪ Participation. ▪ Lab experiment check.
2.2	**Explain and use information from the output of**	• Experiments setting up, data recording and	▪ Compare with standard results.

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
	experiment to draw conclusions.	calculations based on lab manual and lectures (co-requisites).	▪ Feedback and explanations.
2.3	**Summarize conclusions and write reports.**	• Experiments setting up, data recording and calculations based on lab manual and lectures (co-requisites).	▪ Compare with standard results. ▪ Feedback and explanations.
2.4	**Communicate in a clear and concise manner orally, and using IT for acquiring and analyzing information.**	• Lectures. • Class discussions. • Encourage students to use electronic mail and internal network for submitting homework and assignments. • Use digital library.	▪ Exams. ▪ Participation and activities of students in the course community and blackboard. ▪ Feedback and explanations.
3.0	**Values**		
3.1	**Show the collaboration and inter-professionalism in class discussions or team works, as well as solve problems independently.**	• Small team tasks • Open discussion at classroom. • Office hours.	▪ Reports. ▪ Presentations. ▪ Participation.

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	**Lab Activities (Lab quizzes, homework, etc.....)**	**weekly**	**35 %**
2	**Midterm Exam 1**	**5th week**	**7.5 %**
3	**Midterm Exam 2**	**9thweek**	**7.5 %**
4	**Final Exam**	**13thweek**	**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 :

- **Students will be assigned an academic advisor physics graduate committee to give them the appropriate academic counseling and support.**
- **The lecturer of this course will allocate 4 office hours per week to help the students in their course.**
- **Students are able to get individual consultation and academic advice appointment with teaching staff via e-mail or phone calls and department website.**
- **Students are able to get individual consultation appointment with teaching staff via email, phone calls and department website.**

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	
Essential References Materials	
Electronic Materials	**https://units.imamu.edu.sa/colleges/en/science/Pages/default.aspx**
Other Learning Materials	- Laboratory Manual supplied by the Department of Physics. - Laboratory Manual is available at the website of the Department of Physics.

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	• **Each of the class room should be equipped with a whiteboard and a projector.** • **Each class room should be equipped with max 25 seat.**
Technology Resources (AV, data show, Smart Board, software, etc.)	• **Classrooms are equipped with data show and Smart Board, and internet connection.**
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	**See attached file**

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment, Quality of learning resources	• **Students** • **Second assessor**	**During the semester and at the end of the course each student will complete two evaluation forms.**
Extent of achievement of course learning outcomes, Quality of learning resources	• **Instructor** • **Second assessor**	**At the end of each semester the course instructor should complete the course report, including a summary of student questionnaire responses appraising progress and identifying changes that need to be made if necessary.**

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

H. Specification Approval Data

Council / Committee	Quality Unit-Physics Department
Reference No.	Department council No. 11
Date	16/11/2022

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد NCAAA T4 2020

Course Specifications

Course Title:	**Thermal Physics**
Course Code:	**PHY 1230**
Program:	**Bachelor of Science in Physics**
Department:	**Physics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**

Table of Contents

A. Course Identification

1. Credit hours:	**5 (4 Lectures, 0 Lab, 2 Tutorial)**
2. Course type	
a.	University ☐ College ☐ Department ☑ Others ☐
b.	Required ☑ Elective ☐
3. Level/year at which this course is offered:	**Level 5/Year 2**
4.Pre-requisites for this course (if any)**:**	**General Physics (1), PHY 1101 and Calculus (3), MAT 1203**
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**	**72**	**100%**
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	**48**
2	**Laboratory/Studio**	**0**
3	**Tutorial**	**24**
4	**Others** (specify)	**0**
	Total	**72**

B. Course Objectives and Learning Outcomes

1. Course Description

Thermal physics is a core subject in physics, applicable to all its subfields. This course covers the basic principles of thermodynamics including some applications. Fundamental principles are taught in depth, and mathematical tools are presented to equip students for other applications. The First and Second laws of thermodynamics are introduced, along with the concepts of temperature, internal energy, heat, entropy and the thermodynamic potentials. Applications of thermodynamic concepts to topics such as heat engines, the expansion of gases and changes of phase are considered. The Third Law, and associated properties of entropy, is introduced. The kinetic theory of gases completes the course.

2. Course Main Objective

- **Demonstrate the basic concepts of the principles of thermodynamics.**
- **State the basic principles of kinetic theory of gases for ideal and real gases.**
- **Apply these principles in conjunction with elementary mathematical techniques to solve simple problems in the basic four thermodynamic laws.**
- **Assess whether a solution to a given problem is physically reasonable.**

3. Course Learning Outcomes

CLOs After successful completion of the course, students will able to:		Aligned PLOs
1	**Knowledge and Understanding**	
1.1	**Define and describe the laws of thermodynamics.**	**K1, K2**
1.2	**Describe the physical phenomena of thermodynamics.**	**K1, K2**
1.3	**Demonstrate the basic knowledge of the kinetic theory of gases.**	**K1, K2**
2	**Skills:**	
2.1	**Explain and summarize the basic knowledge gained from studying thermal physics.**	**S1, S2**
2.2	**Develop the students ability to solve and analyze problems in physics related the topics covered by the course.**	**S2, S3**
2.3	**Communicate in a clear and concise manner orally, and using IT for acquiring and analyzing information.**	**S4, S5**
3	**Values:**	
3.1	**Show the collaboration and inter-professionalism in class discussions or team works, as well as solve problems independently.**	**V1, V2, V3**

C. Course Content

No	List of Topics	Contact Hours
1	**Nature of Thermodynamics and Equations of State:** Definitions: System, Surroundings, Boundary, Open system, Closed system, Isolated system, Extensive property, Intensive property, State of a system at equilibrium, Processes (quasi-static, reversible, irreversible, adiabatic, isobaric, isothermal, isochoric, cyclic), Heat reservoir. Temperature and the zero law of thermodynamics, Equation of state of an ideal gas, Van Der Waals' equation for a real gas, Expansivity and compressibility.	**16**
2	**First Law of Thermodynamics and Applications:** Exact and inexact differentials, Work (reversible and irreversible processes), Adiabatic work and internal energy, Heat, Mechanical equivalent of Heat, Heat capacity, Mayer's equation, Enthalpy and heats of transformation, Relationships involving enthalpy, Gay-Lussac-Joule experiment, Joule-Thomson experiment.	**16**
3	**Second Law of Thermodynamics and Applications:** Different statements of the second law (Kelvin statement and Clausius statement) Heat engines and the Carnot cycle Irreversible processes, Carnot's theorem, Clausius inequality and the second law, Entropy change in reversible and irreversible processes, Entropy change of the surroundings for a reversible process, TdS equations, Entropy change of	**16**

	an ideal gas, Entropy change for a liquid or solid, Entropy change for a liquid or solid.	
4	**Thermodynamic Potentials and the Third law of Thermodynamics:** Legendre transformation, Definition of the thermodynamic potentials, Maxwell relations, Helmholtz function, Gibbs function, Chemical potential, Phase equilibrium, Mixing processes, Statements of the third law, Equivalence of the statements, Consequences of the third law.	**12**
5	**Kinetic Theory of Gases: Basic assumptions:** Molecular flux, Gas pressure and the ideal gas law, Equipartition of energy, Specific heat capacity of an ideal gas, Distribution of molecular speeds, Mean free path and collision frequency.	**12**
Total		**72**

D. Teaching and Assessment

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

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	**Demonstrate the basic knowledge of the kinetic theory of gases.**	• Lectures. • Tutorials. • Class discussions.	▪ Exams. ▪ Participation. ▪ Discussions.
1.2	**Define and describe the laws of thermodynamics.**	• Lectures. • Tutorials. • Class discussions.	▪ Exams. ▪ Homework. ▪ Quizzes.
1.3	**Outline the basic concepts of the special functions.**	• Lectures. • Class discussions. • Tutorials.	▪ Participation. ▪ Exams. ▪ Discussions. ▪ Homework.
2.0	**Skills**		
2.1	**Explain and summarize the basic knowledge gained from studying thermal physics.**	• Lectures. • Class discussions. • Tutorials.	▪ Exams. ▪ Discussions. ▪ Participation.
2.2	**Develop the students ability to solve and analyze problems in physics related the topics covered by the course.**	• Problem classes and group tutorial. • Homework assignments as well as problems solutions.	▪ Exams. ▪ Discussions. ▪ Homework.
2.3	**Communicate in a clear and concise manner orally, and using IT for acquiring and analyzing information.**	• Lectures. • Class discussions. • Tutorials. • Encourage students to use electronic mail and internal network for submitting homework and assignments. • Use digital library.	▪ Exams. ▪ Participation and activities of students in the course community and blackboard. ▪ Homework.
3.0	**Values**		
3.1	**Show the collaboration and inter-professionalism in class discussions or team works, as**	• Small team tasks • Open discussion at classroom. • Office hours.	▪ Participation. ▪ Homework. ▪ Mini-project(s).

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
	well as solve problems independently.		

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Class Activities (class quizzes, homework, solving problems, etc.....)	weekly	10 %
2	Midterm Exam 1	5thweek	25 %
3	Midterm Exam 2	9thweek	25 %
4	Final Exam	13thweek	40 %

***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 :

- **Students will be assigned an academic advisor to give them the appropriate academic counseling and support.**
- **The lecturer will allocate 6 office hours per week. The assigned times will be advertised on the office door and reserved by the instructor as part of his teaching schedule.**
- **Students are able to get individual consultation appointment with teaching staff via email, phone calls and department website.**

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	Kittel C. and Kroemer H., ***Thermal Physics,*** W. H. Freeman and Company, New York (1980).
Essential References Materials	- Roy B. N, ***Fundamental of classical and statistical thermodynamics,*** J. Wiley& Sons, UK (2002). - Schvoder D.V, ***An introduction to thermal physics,*** Adison Wesley Longman USA (2000). - Russell L.D, ***Classical thermodynamics,*** Inter Edition Saunders College Publ., USA (1993).
Electronic Materials	**https://units.imamu.edu.sa/colleges/en/science/Pages/default.aspx**
Other Learning Materials	**Multimedia associated with the text book and the relevant websites.**

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	• **Each of the class room should be equipped with a whiteboard and a projector.**
Technology Resources (AV, data show, Smart Board, software, etc.)	• **Classrooms are equipped with data show and Smart Board.**
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment, Quality of learning resources.	• **Students** • **Second assessor**	**During the semester and at the end of the course each student will complete two evaluation forms.**
Extent of achievement of course learning outcomes, Quality of learning resources.	• **Instructor** • **Second assessor**	**At the end of each semester the course instructor should complete the course report, including a summary of student questionnaire responses appraising progress and identifying changes that need to be made if necessary.**

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

H. Specification Approval Data

Council / Committee	**Quality Unit-Physics Department**
Reference No.	**Department council No. 11**
Date	**16/11/2022**

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد NCAAA T4 2020

Course Specifications

Course Title:	**Mathematical Physics (1)**
Course Code:	**PHY 1233**
Program:	**Bachelor of Science in Physics**
Department:	**Physics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**

Table of Contents

A. Course Identification

1. Credit hours:	**4 (3 Lectures, 0 Lab, 2 Tutorial)**
2. Course type	
a.	University ☐ College ☐ Department ☑ Others ☐
b.	Required ☑ Elective ☐
3. Level/year at which this course is offered:	**Level 5/Year 2**
4.Pre-requisites for this course (if any)**:**	**Calculus (3), MAT 1203**
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**	**60**	**100%**
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	**36**
2	**Laboratory/Studio**	**0**
3	**Tutorial**	**24**
4	**Others** (specify)	**0**
	Total	**60**

B. Course Objectives and Learning Outcomes

1. Course Description

This course aims to teach how to use a mathematical methods (tools) to solve and explain many problems in physical sciences. The mathematical methods covered in this course include ordinary differential equations, Laplace and Fourier transforms, special function. The course will cover some mathematical techniques commonly used in physics. This is not a course in pure mathematics, but rather on the application of mathematics to solve and explain different problems in physics.

2. Course Main Objective

- **Learn and understand the basic knowledge of ordinary differential. equations, Laplace and Fourier transforms, and special functions.**
- **Demonstrate competence with a wide variety of mathematical tools and techniques.**
- **Demonstrate a breadth of general knowledge in mathematical physics as well as depth in topics covered in this course.**
- **Understand the interactions between mathematics and physics and demonstrate the ability to apply mathematical concepts and techniques into the different problems in physics.**

3. Course Learning Outcomes

CLOs After successful completion of the course, students will able to:		Aligned PLOs
1	**Knowledge and Understanding**	
1.1	**State the basic knowledge of ordinary differential equations and methods for their solution.**	**K1, K2**
1.2	**Describe the Laplace and Fourier transforms.**	**K1, K2**
1.3	**Outline the basic concepts of the special functions.**	**K1, K2**
2	**Skills:**	
2.1	**Explain and summarize the basic knowledge gained from studying mathematical physics course.**	**S1, S2**
2.2	**Develop the students ability to solve and analyze problems in physics related the topics covered by the course.**	**S2, S3**
2.3	**Communicate in a clear and concise manner orally, on paper and using IT for acquiring and analyzing information.**	**S4, S5**
3	**Values:**	
3.1	**Show the collaboration and inter-professionalism in class discussions or team works, as well as solve problems independently.**	**V1, V2, V3**

C. Course Content

No	List of Topics	Contact Hours
1	**First order differential equations:** Definitions, Separable equations, Homogeneous equations, Linear differential equations, Exact differential equations, Integrating Factor. Applications.	**14**
2	**Second order linear differential equations with constants coefficients:** Definitions: difference between linear and non-linear, Homogeneous equations with constant coefficients Non-homogeneous equations. Variation of parameters (general method). Applications.	**12**
3	**Integral Transforms:** Laplace transforms (LTs), properties of LT, Laplace transform of derivatives, Inverse Laplace transform. Applications.	**12**
4	**Fourier series and Fourier transforms:** Fourier Sine – Cosine transform- complex Fourier transform. Fourier transform – inversion theorem- Fourier transform of derivatives, Convolution theorem, momentum representation. Applications.	**12**

5	**Special Functions:** Introduction, The factorial function, Definition of the Gamma function; Recursion relation, The Gamma function of negative numbers, Some important formulas involving gamma functions, Beta functions, Beta functions in terms of Gamma functions, The simple pendulum, The error function, Asymptotic series, Stirling's formula, Elliptic integrals and functions.	**10**
Total		**60**

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	**State the basic knowledge of ordinary differential equations and methods for their solution.**	• Lectures. • Tutorials. • Class discussions.	▪ Exams. ▪ Participation. ▪ Discussions.
1.2	**Describe the Laplace and Fourier transforms**.	• Lectures. • Tutorials. • Class discussions.	▪ Exams. ▪ Homework. ▪ Quizzes.
1.3	**Outline the basic concepts of the special functions.**	• Lectures. • Class discussions. • Tutorials.	▪ Participation. ▪ Exams. ▪ Discussions. ▪ Homework.
2.0	**Skills**		
2.1	**Explain and summarize the basic knowledge gained from studying mathematical physics course.**	• Lectures. • Class discussions. • Tutorials.	▪ Exams. ▪ Discussions. ▪ Participation.
2.2	**Develop the students ability to solve and analyze problems in physics related the topics covered by the course.**	• Problem classes and group tutorial. • Homework assignments as well as problems solutions.	▪ Exams. ▪ Discussions. ▪ Homework.
2.3	**Communicate in a clear and concise manner orally, on paper and using IT for acquiring and analyzing information.**	• Lectures. • Class discussions. • Tutorials. • Encourage students to use electronic mail and internal network for submitting homework and assignments. • Use digital library.	▪ Exams. ▪ Participation and activities of students in the course community and blackboard. ▪ Homework.
3.0	**Values**		
3.1	**Show the collaboration and inter-professionalism in class discussions or team works, as well as solve problems independently.**	• Small team tasks • Open discussion at classroom. • Office hours.	▪ Participation ▪ Homework's ▪ Mini-project(s).

Code	Course Learning Outcomes	TeachingStrategies	AssessmentMethods

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Class Activities (class quizzes, homework, solving problems, etc.....)	weekly	10 %
2	Midterm Exam 1	5thweek	25 %
3	Midterm Exam 2	9thweek	25 %
4	Final Exam	13thweek	40 %

***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 :

- **Students will be assigned an academic advisor to give them the appropriate academic counseling and support.**
- **The lecturer will allocate 6 office hours per week. The assigned times will be advertised on the office door and reserved by the instructor as part of his teaching schedule.**
- **Students are able to get individual consultation appointment with teaching staff via email, phone calls and department website.**

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	Boas M.L. ***Mathematical Methods in the Physical Sciences***, 3rd Edition, John Wiley (2006).
Essential References Materials	-Chow T., ***Mathematical Methods for Physicists: A Concise Introduction***, Cambridge University Press (2000). -Riley K.F., Hobson M.P., and Bence S.J., ***Mathematical Methods for Physics and Engineering***, 3th Edition, Cambridge University Press, 2006.
Electronic Materials	**https://units.imamu.edu.sa/colleges/en/science/Pages/default.aspx**
Other Learning Materials	**Multimedia associated with the textbook and the relevant websites.**

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	• **Each of the class room should be equipped with a whiteboard and a projector.**
Technology Resources (AV, data show, Smart Board, software, etc.)	• **Classrooms are equipped with data show and Smart Board.**
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment, Quality of learning resources.	• Students • Second assessor	During the semester and at the end of the course each student will complete two evaluation forms.
Extent of achievement of course learning outcomes, Quality of learning resources.	• Instructor • Second assessor	At the end of each semester the course instructor should complete the course report, including a summary of student questionnaire responses appraising progress and identifying changes that need to be made if necessary.

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	Quality Unit-Physics Department
Reference No.	Department council No. 11
Date	16/11/2022

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد NCAAA T4 2020

Course Specifications

Course Title:	**Waves & Optics Laboratory**
Course Code:	**PHY 1282**
Program:	**Bachelor of Science in Physics**
Department:	**Physics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**

Table of Contents

A. Course Identification

1. Credit hours:	**2 (0 Lectures, 2 Lab, 2 Tutorial)**
2. Course type	
a.	University ☐ College ☐ Department ☑ Others ☐
b.	Required ☑ Elective ☐
3. Level/year at which this course is offered:	**Level 5/Year 2**
4.Pre-requisites for this course (if any)**:**	**Waves & Optics, PHY 1240**
5. Co-requisites for this course (if any)**:**	

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	**48**	**100%**
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	**0**
2	**Laboratory/Studio**	**24**
3	**Tutorial**	**24**
4	**Others** (specify)	**0**
	Total	**48**

B. Course Objectives and Learning Outcomes

1. Course Description

Significant experiments chosen from light, optical instruments and polarization and other related topics. Attention is given to laboratory techniques and data analysis. Every class will have a short lecture introducing the procedures, concepts, formulas and instructions relevant to the experiment. The lecture will also cover what is expected in the lab-report; don't be late. Attendance and participation is mandatory. Experiments will usually be performed in groups, but each student will turn in an individual lab report

2. Course Main Objective

- **Observe and analyze physical data relevant to some of the experiments in optics and wave.**
- **Provide students with a thorough understanding of the basic concepts of physics and the methods scientists use to explore natural phenomena, including observation, hypothesis development, measurement and data collection, experimentation, evaluation of evidence, and employment of mathematical analysis.**
- **Develop the student's mathematical ability to manipulate formulae and derive correct numerical solutions that can be measured in the real world.**
- **Instruct students in the competent use of laboratory equipment to collect and record data, apply relevant mathematical models and perform required computations, and present the derived results as an application of a measured observation of the physical world**.

3. Course Learning Outcomes

	CLOs After successful completion of the course, students will able to:	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	**Recognize the scientific method of inquiry to draw conclusions based on light wave and associated characteristics.**	**K1;K2**
1.2	**Define the theoretical bases of light optics experiments.**	**K1;K2**
1.3	**Describe the theoretical bases of laws of imaging and optical instruments experiments.**	**K1;K2**
2	**Skills:**	
2.1	**Analyze experiments according to the plan besides the learning from lab lecture.**	**S1; S2**
2.2	**Explain and use information from the output of experiment to draw conclusions.**	**S2; S3**
2.3	**Summarize conclusions and write reports.**	**S3; S4**
2.4	**Make efficient use of computer for acquiring, analyzing and presenting information.**	**S4; S5**
3	**Values:**	
3.1	**Show the collaboration and inter-professionalism in class discussions or team works, as well as solve problems independently.**	**V1; V2; V3**

C. Course Content

No	List of Topics	Contact Hours
1	**Introduction**	**6**
2	**Experiment 1:** Reflection and refraction of light.	**4**
3	**Experiment 2:** Laws of imaging.	**4**
4	**Experiment 3:** Optical instruments.	**4**
5	**Experiment 4:** Newton's rings in transmitted monochromatic light.	**4**
6	**Experiment 5:** Interference at a Fresnel's mirror with an He-Ne laser.	**4**
7	**Experiment 6:** Diffraction at a single slit.	**4**
8	**Experiment 7:** Diffraction at a double slit.	**4**
9	**Experiment 8:** Diffraction grating spectrometer.	**4**

10	**Experiment 9:** Rotation of the plane of polarization with sugar solutions.	**4**
11	**Revision.**	**6**
Total		**48**

D. Teaching and Assessment

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

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	**Recognize the scientific method of inquiry to draw conclusions based on light wave and associated characteristics.**	• Supervision by lab instructor • Submitting an individual lab report. • Performing lab. experiments at the scheduled times.	▪ Participation. ▪ Report evaluation. ▪ Lab experiment check. ▪ Exams.
1.2	**Define the theoretical bases of light optics experiments.**	• Supervision by lab instructor • Submitting an individual lab report. • Performing lab. experiments at the scheduled times.	▪ Discussion. ▪ Report evaluation. ▪ Lab experiment check. ▪ Exams.
1.3	**Describe the theoretical bases of laws of imaging and optical instruments experiments.**	• Supervision by lab instructor • Submitting an individual lab report. • Performing lab. experiments at the scheduled times.	▪ Participation. ▪ Report evaluation. ▪ Lab experiment check. ▪ Exams.
2.0	**Skills**		
2.1	**Analyze experiments according to the plan besides the learning from lab lecture.**	• Using the multimedia and visual materials, Lab manual and the theoretical bases of the course. • Interaction between students in the lab course community and discussions in the lab.	▪ Participation. ▪ Lab experiment check.
2.2	**Explain and use information from the output of experiment to draw conclusions.**	• Experiments setting up, data recording and calculations based on lab manual and lectures (co-requisites).	▪ Compare with standard results. ▪ Feedback and explanations.
2.3	**Summarize conclusions and write reports.**	• Experiments setting up, data recording and calculations based on lab manual and lectures (co-requisites).	▪ Compare with standard results. ▪ Feedback and explanations.

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
2.4	**Communicate in a clear and concise manner orally, paper and using IT for acquiring and analyzing information.**	• Lectures. • Class discussions. • Encourage students to use electronic mail and internal network for submitting homework and assignments. • Use digital library.	▪ Exams. ▪ Participation and activities of students in the course community and blackboard. ▪ Feedback and explanations.
3.0	**Values**		
3.1	**Show the collaboration and inter-professionalism in class discussions or team works, as well as solve problems independently.**	• Small team tasks • Open discussion at classroom. • Office hours.	▪ Reports. ▪ Presentations. ▪ Participation.

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	**Lab Activities (Lab quizzes, reports, homework, solving problems, etc.....)**	**weekly**	**35 %**
2	**Midterm Exam 1**	**5thweek**	**7.5 %**
3	**Midterm Exam 2**	**9thweek**	**7.5 %**
4	**Final Exam**	**13thweek**	**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 :

- **Students will be assigned an academic advisor to give them the appropriate academic counseling and support.**
- **The lecturer will allocate 4 office hours per week. The assigned times will be advertised on the office door and reserved by the instructor as part of his teaching schedule.**
- **Students are able to get individual consultation appointment with teaching staff via email, phone calls and department website.**

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	
Essential References Materials	
Electronic Materials	**https://units.imamu.edu.sa/colleges/en/science/Pages/default.aspx**
Other Learning Materials	• Laboratory Manual supplied by the Department of Physics. • Laboratory Manual is available at the website of the Department of Physics.

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	• Each of the class room should be equipped with a whiteboard and a projector. • Each class room should be equipped with max 25 seat.
Technology Resources (AV, data show, Smart Board, software, etc.)	• Classrooms are equipped with data show and Smart Board, and internet connection.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	See attached file

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment, Quality of learning resources.	• Students • Second assessor	During the semester and at the end of the course each student will complete two evaluation forms.
Extent of achievement of course learning outcomes, Quality of learning resources.	• Instructor • Second assessor	At the end of each semester the course instructor should complete the course report, including a summary of student questionnaire responses appraising progress and identifying changes that need to be made if necessary.

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

H. Specification Approval Data

Council / Committee	Quality Unit-Physics Department
Reference No.	Department council No. 11
Date	16/11/2022

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد NCAAA T4 2020

Course Specifications

Course Title:	**Classical Mechanics (2)**
Course Code:	**PHY 1203**
Program:	**Bachelor of Science in Physics**
Department:	**Physics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**

Table of Contents

A. Course Identification

1. Credit hours:	**4 (3 Lectures, 0 Lab, 2 Tutorial)**
2. Course type	
a.	University ☐ College ☐ Department ☑ Others ☐
b.	Required ☑ Elective ☐
3. Level/year at which this course is offered:	**Level 6/Year 2**
4.Pre-requisites for this course (if any)**:**	**Classical Mechanics (1), PHY 1105 and Calculus (3), MAT 1203**
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**	**60**	**100%**
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	**36**
2	**Laboratory/Studio**	**0**
3	**Tutorial**	**24**
4	**Others** (specify)	**0**
	Total	**60**

B. Course Objectives and Learning Outcomes

1. Course Description

This course deals with fundamental concepts and principles in classical mechanics, applied to particles, systems of particles and rigid bodies. Vector calculus is used extensively to explore topics. The Lagrangian formulation of mechanics is introduced to show its powerful problem solving ability. Modern notation and terminology are used throughout in support of the course objectives: to facilitate students' transition to advanced physics and the mathematical formalism needed for the quantum theory of physics.

2. Course Main Objective

- **Understand the notions of configuration space, generalized coordinates space in mechanics.**
- **Explain various aspects of classical dynamics.**
- **Obtain the Euler-Lagrange equations from the variational principle.**
- **Understand the relation between Lagrange's equations and Newton's laws.**
- **Use Lagrange's equations to solve complex mechanical problems.**
- **Obtain the Hamiltonian formulation of a mechanical system.**
- **Develop problem solving and critical thinking skills.**

3. Course Learning Outcomes

CLOs After successful completion of the course, students will able to:		Aligned PLOs
1	**Knowledge and Understanding**	
1.1	**Demonstrate and describe the behavior of principle's variations.**	**K1, K2**
1.2	**Describe the central-force motion and the motion in a non-inertial reference frame.**	**K1, K2**
1.3	**State the basic knowledge of Lagrangian and Hamiltonian dynamics.**	**K1, K2**
1.4	**Outline the basic knowledge of dynamics of rigid bodies.**	**K1, K2**
2	**Skills:**	
2.1	**Explain and summarize the basic knowledge gained from studying classical mechanics.**	**S1, S2**
2.2	**Develop the students ability to solve and analyze problems in physics related the topics covered by the course.**	**S2, S3**
2.3	**Communicate in a clear and concise manner orally, and using IT for acquiring and analyzing information.**	**S4, S5**
3	**Values:**	
3.1	**Show the collaboration and inter-professionalism in class discussions or team works, as well as solve problems independently.**	**V1, V2, V3**

C. Course Content

No	List of Topics	Contact Hours
1	**Coordinate Systems and Transformation:** Cartesian coordinates; circular cylindrical coordinates; spherical coordinates.	**8**
2	**Some Methods in the Calculus of Variations:** Euler's equation, functions with several dependent variables, Euler's equation when auxiliary conditions are imposed.	**8**
3	**Lagrangian and Hamiltonian Mechanics:** Hamiltonian's principle, generalized coordinates, Lagrange's equations of motion in generalized coordinates, Lagrange's equations with undetermined multipliers, equivalence of Lagrange's and Newton's equations, a theorem concerning the kinetic energy, conservation theorems, canonical equations of motion– Hamiltonian mechanics.	**14**
4	**Central Force Motion:**Reduced mass, conservation theorems-first integrals of the motion, planetary motion-Kepler's problem.	**12**

5	**Motion in a non-inertial reference frame:** Rotating coordinate systems, centrifugal and Coriolis forces, motion relative to the earth.	**10**
6	**Mechanics of rigid Bodies:** Inertia tensor, angular momentum, principal axes of inertia, moments of inertia for different body coordinate systems, Eulerian angles, Euler's equations for a rigid body.	**8**
Total		**60**

D. Teaching and Assessment

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

Code	Course Learning Outcomes	TeachingStrategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	**Demonstrate and describe the behavior of principle's variations.**	• Lectures. • Tutorials. • Class discussions.	▪ Exams. ▪ Participation. ▪ Discussions.
1.2	**Describe the central-force motion and the motion in a non-inertial reference frame.**	• Lectures. • Tutorials. • Class discussions.	▪ Exams. ▪ Homework. ▪ Quizzes.
1.3	**State the basic knowledge of Lagrangian and Hamiltonian dynamics.**	• Lectures. • Class discussions. • Tutorials.	▪ Participation. ▪ Exams. ▪ Discussions. ▪ Homework.
1.4	**Outline the basic knowledge of dynamics of rigid bodies.**	• Lectures. • Class discussions. • Tutorials.	▪ Participation. ▪ Exams. ▪ Discussions. ▪ Homework.
2.0	**Skills**		
2.1	**Explain and summarize the basic knowledge gained from studying classical mechanics.**	• Lectures. • Class discussions. • Tutorials.	▪ Exams. ▪ Discussions. ▪ Participation.
2.2	**Develop the students ability to solve and analyze problems in physics related the topics covered by the course.**	• Problem classes and group tutorial. • Homework assignments as well as problems solutions.	▪ Exams. ▪ Discussions. ▪ Homework.
2.3	**Communicate in a clear and concise manner orally, and using IT for acquiring and analyzing information.**	• Lectures. • Class discussions. • Tutorials. • Encourage students to use electronic mail and internal network for submitting homework and assignments. • Use digital library.	▪ Exams. ▪ Participation and activities of students in the course community and blackboard. ▪ Homework.
3.0	**Values**		
3.1	**Show the collaboration and inter-professionalism in class discussions or team works, as well as solve problems independently.**	• Small team tasks • Open discussion at classroom. • Office hours.	▪ Participation ▪ Homework's ▪ Mini-project(s).

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Class Activities (class quizzes, homework, solving problems, etc.....)	weekly	10 %
2	Midterm Exam 1	5thweek	25%
3	Midterm Exam 2	9thweek	25 %
4	Final Exam	13thweek	40 %

***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 :

- **Students will be assigned an academic advisor to give them the appropriate academic counseling and support.**
- **The lecturer will allocate 6 office hours per week. The assigned times will be advertised on the office door and reserved by the instructor as part of his teaching schedule.**
- **Students are able to get individual consultation appointment with teaching staff via email, phone calls and department website.**

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	Thornton S.T. and Marion J.B., **Classical Dynamics of Particles and Systems,** 5th Edition, Thomas Learning Inc. (2004).
Essential References Materials	- Fowles G.R. and Cassiday G., ***Analytical Mechanics, 7th Edition,*** Brooks Cole Publishing (2004). - Goldstein H., Poole C., and Safko J., ***Classical Mechanics,***3rd Edition, Addison-Wesley (2000).
Electronic Materials	**https://units.imamu.edu.sa/colleges/en/science/Pages/default.aspx**
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	• **Each of the class room should be equipped with a whiteboard and a projector.**
Technology Resources (AV, data show, Smart Board, software, etc.)	• **Classrooms are equipped with data show and Smart Board.**
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment, Quality of learning resources	• Students • Second assessor	During the semester and at the end of the course each student will complete two evaluation forms.
Extent of achievement of course learning outcomes, Quality of learning resources	• Instructor • Second assessor	At the end of each semester the course instructor should complete the course report, including a summary of student questionnaire responses appraising progress and identifying changes that need to be made if necessary.

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	Quality Unit-Physics Department
Reference No.	Department council No. 11
Date	16/11/2022

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد NCAAA T4 2020

Course Specifications

Course Title:	**Modern Physics**
Course Code:	**PHY 1250**
Program:	**Bachelor of Science in Physics**
Department:	**Physics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**

Table of Contents

A. Course Identification

1. Credit hours:	**4 (3 Lectures, 0 Lab, 2 Tutorial)**
2. Course type	
a.	University ☐ College ☐ Department ☑ Others ☐
b.	Required ☑ Elective ☐
3. Level/year at which this course is offered:	**Level 6/Year 2**
4.Pre-requisites for this course (if any)**:**	**Wave & Optics, PHY 1240**
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	60	100%
2	Blended		
3	E-learning		
4	Distance learning		
5	Other		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	36
2	Laboratory/Studio	0
3	Tutorial	24
4	Others (specify)	0
	Total	60

B. Course Objectives and Learning Outcomes

1. Course Description

This course provides an introduction to developments in modern physics over the last 150 years that have radically altered our view of nature. This course is intended for students who have already had basic physics and calculus courses. Relativity and quantum ideas are considered first to provide a framework for understanding the physics of atom and nuclei. The theory of the atom is then developed with emphasis on quantum mechanical notions. Next comes a discussion of the properties of aggregates of atoms, which includes a look at statistical physics. Finally, atomic nuclei and elementary particles are examined.

2. Course Main Objective

- **State the basic principles of special relativity and elementary quantum mechanics and the regimes in which the different theories apply.**
- **Apply these principles in conjunction with elementary mathematical techniques to solve simple problems in relativistic and quantum mechanics.**
- **Present a solution to a physics problem in a clear and logical written form.**
- **Take responsibility for learning by attending lectures and workshops, and completing coursework.**

3. Course Learning Outcomes

CLOs After successful completion of the course, students will able to:		Aligned PLOs
1	**Knowledge and Understanding**	
1.1	**Describe the basic knowledge of the molecular and nuclear structure.**	**K1, K2**
1.2	**Recall the basics of quantum theory of light and atomic structure.**	**K1, K2**
1.3	**Outline the basic concepts of relativity.**	**K1, K2**
2	**Skills:**	
2.1	**Explain and summarize the basic knowledge gained from studying modern physics course.**	**S1, S2**
2.2	**Develop the students ability to solve and analyze problems in physics related the topics covered by the course.**	**S2, S3**
2.3	**Communicate in a clear and concise manner orally, on paper and using IT for acquiring and analyzing information.**	**S4, S5**
3	**Values:**	
3.1	**Show the collaboration and inter-professionalism in class discussions or team works, as well as solve problems independently.**	**V1, V2, V3**

C. Course Content

No	List of Topics	Contact Hours
1	**Relativity:** Einstein's principle of special relativity, consequences of special relativity, Lorentz transformation equations, Relativistic momentum and relativistic form of Newton's laws, Relativistic energy, Equivalence of mass and energy.	**14**
2	**Quantum Theory of Light:** Particle properties of waves, Blackbody radiation and Planck's hypothesis, Photoelectric effect, Explanation of the photoelectric effect, X-rays and some applications, Compton effect, Pair production.	**14**
3	**Introduction to Quantum Physics:** Photons and electromagnetic waves, Wave properties of particles, De Broglie waves, Matter waves, Electron microscope, Uncertainty principle.	**12**
4	**Atomic Structure:** Particle nature of matter, Early models of the atom, Bohr's quantum model of the hydrogen atom, Atomic spectra and transitions, Nuclear effects on spectral lines, Franck-Hertz experiment.	**10**
5	**Molecular and nuclear Structure:** Molecular bonding, Energy states	**10**

	and spectra, Molecular vibration and rotation, Electronic transitions in molecules. Nuclear Structure: Nuclear composition, Some properties of nuclei, Binding energy and radioactivity.	
Total		**60**

D. Teaching and Assessment

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

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	**State the basic knowledge of the molecular and nuclear structure.**	• Lectures. • Tutorials. • Class discussions.	▪ Exams. ▪ Participation. ▪ Discussions.
1.2	**Describe the basics of quantum theory of light and atomic structure.**	• Lectures. • Tutorials. • Class discussions.	▪ Exams. ▪ Homework. ▪ Quizzes.
1.3	**Outline the scientific foundation for applications of modern physics.**	• Lectures. • Class discussions. • Tutorials.	▪ Participation. ▪ Exams. ▪ Discussions. ▪ Homework.
2.0	**Skills**		
2.1	**Explain and summarize the basic knowledge gained from studying mathematical physics course.**	• Lectures. • Class discussions. • Tutorials.	▪ Exams. ▪ Discussions. ▪ Participation.
2.2	**Develop the students ability to solve and analyze problems in physics related the topics covered by the course.**	• Problem classes and group tutorial. • Homework assignments as well as problems solutions.	▪ Exams. ▪ Discussions. ▪ Homework.
2.3	**Communicate in a clear and concise manner orally, and using IT for acquiring and analyzing information.**	• Lectures. • Class discussions. • Tutorials. • Encourage students to use electronic mail and internal network for submitting homework and assignments. • Use digital library.	▪ Exams. ▪ Participation and activities of students in the course community and blackboard. ▪ Homework.
3.0	**Values**		
3.1	**Show the collaboration and inter-professionalism in class discussions or team works, as well as solve problems independently.**	• Small team tasks • Open discussion at classroom. • Office hours.	▪ Participation ▪ Homework's ▪ Mini-project(s).

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	**Class Activities (class quizzes, homework, solving problems, etc.....)**	**weekly**	**10 %**
2	**Midterm Exam 1**	**5thweek**	**25 %**
3	**Midterm Exam 2**	**9thweek**	**25 %**
4	**Final Exam**	**13thweek**	**40 %**

***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 :

- **Students will be assigned an academic advisor to give them the appropriate academic counseling and support.**
- **The lecturer will allocate 6 office hours per week. The assigned times will be advertised on the office door and reserved by the instructor as part of his teaching schedule.**
- **Students are able to get individual consultation appointment with teaching staff via email, phone calls and department website.**

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	Beiser A. and Berg I., ***Concepts of Modern Physics***, 6th Edition, McGraw-Hill, Inc (2006).
Essential References Materials	- Serway R.A., ***Modern Physics,*** Brooks Cole; 3rd Edition (2004). - Krane K., ***Modern Physics,*** Wiley, New York (1983).
Electronic Materials	https://units.imamu.edu.sa/colleges/en/science/Pages/default.aspx
Other Learning Materials	Multimedia associated with the text book and the relevant websites.

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	• **Each of the class room should be equipped with a whiteboard and a projector.**
Technology Resources (AV, data show, Smart Board, software, etc.)	• **Classroomsare equipped with data show and Smart Board.**
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment, Quality of learning resources.	• Students • Second assessor	During the semester and at the end of the course each student will complete two evaluation forms.
Extent of achievement of course learning outcomes, Quality of learning resources.	• Instructor • Second assessor	At the end of each semester the course instructor should complete the course report, including a summary of student questionnaire responses appraising progress and identifying changes that need to be made if necessary.

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

H. Specification Approval Data

Council / Committee	Quality Unit-Physics Department
Reference No.	Department council No. 11
Date	16/11/2022

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد NCAAA T4 2020

Course Specifications

Course Title:	**Thermal Physics & Mechanics Lab**
Course Code:	**PHY 1283**
Program:	**Bachelor of Science in Physics**
Department:	**Physics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**

Table of Contents

A. Course Identification

1. Credit hours:	**2 (0 Lectures, 2 Lab, 2 Tutorial)**
2. Course type	
a.	University ☐ College ☐ Department ☑ Others ☐
b.	Required ☑ Elective ☐
3. Level/year at which this course is offered:	**Level 6/Year 2**
4.Pre-requisites for this course (if any)**:**	**Thermal Physics, PHY 1230**
5. Co-requisites for this course (if any)**:**	

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	48	100%
2	Blended		
3	E-learning		
4	Distance learning		
5	Other		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	0
2	Laboratory/Studio	24
3	Tutorial	24
4	Others (specify)	0
	Total	48

B. Course Objectives and Learning Outcomes

1. Course Description

This course is designed to aid students in the development of core practical skills in Physics. The course includes a series of experiments exploring fundamental concepts in thermal physics and mechanics. Every class will have a short lecture introducing the procedures, concepts, formulas and instructions relevant to the experiment. The lecture will also cover what is expected in the lab-report; don't be late. Attendance and participation is mandatory. Experiments will usually be performed in groups, but each student will turn in an individual lab report.

2. Course Main Objective

- **Observe and analyze physical data relevant to some of the experiments in thermal physics and mechanics.**
- **Provide students with a thorough understanding of the basic concepts of physics and the methods scientists use to explore natural phenomena, including observation, hypothesis development, measurement and data collection, experimentation, evaluation of evidence, and employment of mathematical analysis.**
- **Develop the student's mathematical ability to manipulate formulae and derive correct numerical solutions that can be measured in the real world.**
- **Instruct students in the competent use of laboratory equipment to collect and record data, apply relevant mathematical models and perform required computations, and present the derived results as an application of a measured observation of the physical world.**

3. Course Learning Outcomes

CLOs After successful completion of the course, students will able to:		Aligned PLOs
1	**Knowledge and Understanding**	
1.1	**Recognize the scientific method of inquiry to draw conclusions based on verifiable evidence such as expansion of solids and liquids.**	**K1;K2**
1.2	**Describe the theoretical bases of specific heat of solids, specific vaporization heat of liquids and latent heat of solids experiments.**	**K1;K2**
1.3	**Outline the concepts of experiments in thermal Physics and mechanics.**	**K1;K2**
2	**Skills:**	
2.1	**Analyze experiments according to the plan besides the learning from lab lecture.**	**S1; S2**
2.2	**Explain and use information from the output of experiment to draw conclusions.**	**S2; S3**
2.3	**Summarize conclusions and write reports.**	**S3; S4**
2.4	**Communicate in a clear and concise manner orally, and using IT for acquiring and analyzing information.**	**S4; S5**
3	**Values:**	
3.1	**Show the collaboration and inter-professionalism in class discussions or team works, as well as solve problems independently.**	**V1; V2; V3**

C. Course Content

No	List of Topics	Contact Hours
1	**Experiment 1:** Inscription in the lab and distribution of the group.	**4**
2	**Experiment 2:** Path-time diagrams of rotational motion: Measurements the angular velocity, angular acceleration.	**4**
3	**Experiment 3:** Conservation of Energy by using Maxwell's Wheel.	**4**
4	**Experiment 4:** Laws of Gyroscopes / 3-axis gyroscope.	**4**
5	**Experiment 5:** Damped and Forced Oscillations – Pohl's Torsional Pendulum: part 1.	**4**

6	**Experiment 6:** Damped and Forced Oscillations – Pohl's Torsional Pendulum: part 2.	**4**
7	**Experiment 7:** Determining the Specific Heat Capacity of Solids.	**4**
8	**Experiment 8:** The thermal expansion of solid bodies: Measuring the linear thermal expansion.	**4**
9	**Experiment 9:** Boyle s law: verification of Boyle s law, and measuring the atmospheric pressure.	**4**
10	**Experiment 10:** Determining the volumetric expansion coefficient of water as liquid.	**4**
11	**Experiment 11:**The latent heat of water	**4**
12	**Revision**	**4**
Total		**48**

D. Teaching and Assessment

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

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	**Recognize the scientific method of inquiry to draw conclusions based on verifiable evidence such as expansion of solids and liquids.**	• Supervision by lab instructor • Submitting an individual lab report. • Performing lab. experiments at the scheduled times.	▪ Participation. ▪ Report evaluation. ▪ Lab experiment check. ▪ Exams.
1.2	**Describe the theoretical bases of specific heat of solids, specific vaporization heat of liquids and latent heat of solids experiments.**	• Supervision by lab instructor • Submitting an individual lab report. • Performing lab. experiments at the scheduled times.	▪ Discussion. ▪ Report evaluation. ▪ Lab experiment check. ▪ Exams.
1.3	**Outline the concepts of experiments in thermal Physics and mechanics.**	• Supervision by lab instructor • Submitting an individual lab report. • Performing lab. experiments at the scheduled times.	▪ Participation. ▪ Report evaluation. ▪ Lab experiment check. ▪ Exams.
2.0	**Skills**		
2.1	**Analyze experiments according to the plan besides the learning from lab lecture.**	• Using the multimedia and visual materials, Lab manual and the theoretical bases of the course. • Interaction between students in the lab course community and	▪ Participation. ▪ Lab experiment check.

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
		discussions in the lab.	
2.2	**Explain and use information from the output of experiment to draw conclusions.**	• Experiments setting up, data recording and calculations based on lab manual and lectures (co-requisites).	▪ Compare with standard results. ▪ Feedback and explanations.
2.3	**Summarize conclusions and write reports.**	• Experiments setting up, data recording and calculations based on lab manual and lectures (co-requisites).	▪ Compare with standard results. ▪ Feedback and explanations.
2.4	**Communicate in a clear and concise manner orally, and using IT for acquiring and analyzing information.**	• Lectures. • Class discussions. • Encourage students to use electronic mail and internal network for submitting homework and assignments. • Use digital library.	▪ Exams. ▪ Participation and activities of students in the course community and blackboard. ▪ Feedback and explanations.
3.0	**Values**		
3.1	**Show the collaboration and inter-professionalism in class discussions or team works, as well as solve problems independently.**	• Small team tasks • Open discussion at classroom. • Office hours.	▪ Reports. ▪ Presentations. ▪ Participation.

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	**Lab Activities (Lab quizzes, homework, etc.....)**	**weekly**	**35 %**
2	**Midterm Exam 1**	**5th week**	**7.5 %**
3	**Midterm Exam 2**	**9thweek**	**7.5 %**
4	**Final Exam**	**13thweek**	**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 :

- **Students will be assigned an academic advisor physics graduate committee to give them the appropriate academic counseling and support.**
- **The lecturer of this course will allocate 4 office hours per week to help the students in their course.**
- **Students are able to get individual consultation and academic advice appointment with teaching staff via e-mail or phone calls and department website.**
- **Students are able to get individual consultation appointment with teaching staff via email, phone calls and department website.**

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	
Essential References Materials	
Electronic Materials	**https://units.imamu.edu.sa/colleges/en/science/Pages/default.aspx**
Other Learning Materials	- Laboratory Manual supplied by the Department of Physics. - Laboratory Manual is available at the website of the Department of Physics.

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	• **Each of the class room should be equipped with a whiteboard and a projector.** • **Each class room should be equipped with max 25 seat.**
Technology Resources (AV, data show, Smart Board, software, etc.)	• **Classrooms are equipped with data show and Smart Board, and internet connection.**
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	**See attached file**

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment, Quality of learning resources	• **Students** • **Second assessor**	**During the semester and at the end of the course each student will complete two evaluation forms.**
Extent of achievement of course learning outcomes, Quality of learning resources	• **Instructor** • **Second assessor**	**At the end of each semester the course instructor should complete the course report, including a summary of student questionnaire responses appraising progress and identifying changes that need to be made if necessary.**

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

H. Specification Approval Data

Council / Committee	Quality Unit-Physics Department
Reference No.	Department council No. 11
Date	16/11/2022

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد NCAAA T4 2020

Course Specifications

Course Title:	**Quantum Mechanics (1)**
Course Code:	**PHY 1312**
Program:	**Bachelor of Science in Physics**
Department:	**Physics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**

Table of Contents

A. Course Identification

1. Credit hours:	**4 (3 Lectures, 0 Lab, 2 Tutorial)**
2. Course type	
a.	University ☐ College ☐ Department ☑ Others ☐
b.	Required ☑ Elective ☐
3. Level/year at which this course is offered:	**Level 7/Year 3**
4.Pre-requisites for this course (if any)**:**	**Modern Physics, PHY 1250 and Intr. Probability & Statistics, STA 1111**
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	60	100%
2	Blended		
3	E-learning		
4	Distance learning		
5	Other		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	36
2	Laboratory/Studio	0
3	Tutorial	24
4	Others (specify)	0
	Total	60

B. Course Objectives and Learning Outcomes

1. Course Description

This course provides an introduction to the concepts and formalism of quantum mechanics. Primary emphasis is on the time-independent Schrödinger equation and its applications to simple systems such as the harmonic oscillator, the square-well potential, Delta-function potential, and the hydrogen atom without spin. The postulates of quantum mechanics will be developed in the formalism of operator observables acting on a linear state space of wave functions, in analogy with finite dimensional matrix operations on vectors.

2. Course Main Objective

- **Know the main features of the historical development of quantum mechanics.**
- **Acquire knowledge of the core aspects of quantum mechanics.**
- **Learn how to use the tools of quantum mechanics.**
- **Apply foundational mathematics to quantum mechanics.**
- **Learn the techniques to solve, through discussion and reading, a wide range of specific theoretical problems including their backgrounds and implications.**

3. Course Learning Outcomes

	CLOs After successful completion of the course, students will able to:	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	**Outline the background and main features of the historical development of quantum mechanics.**	**K1, K2**
1.2	**State the historical importance of De Broglie's hypothesis, Schrödinger's wave function, and Born's probabilistic interpretation of the wave function.**	**K1, K2**
1.3	**Describe and solve the Schrödinger equation in the standard one-dimensional examples-infinite and finite square wells, infinite well potentials, free particle, harmonic oscillator, and hydrogen atom.**	**K1, K2**
1.4	**Define and describe the Hilbert space, Dirac notation, and Basic postulates of Quantum Mechanics.**	**K1, K2**
2	**Skills:**	
2.1	**Explain and summarize the basic knowledge gained from studying quantum mechanics.**	**S1, S2**
2.2	**Develop the students ability to solve and analyze problems in physics related the topics covered by the course.**	**S2, S3**
2.3	**Communicate in a clear and concise manner orally, on paper and using IT for acquiring and analyzing information.**	**S4, S5**
3	**Values:**	
3.1	**Show the collaboration and inter-professionalism in class discussions or team works, as well as solve problems independently.**	**V1, V2, V3**

C. Course Content

No	List of Topics	Contact Hours
1	**Introduction (Historical Background)**: Development of the quantum theory, Experiments that led to the formulation of quantum mechanics, Wave-particle duality.	**4**
2	**Wave Function:** Schrödinger equation, Statistical interpretation, Probability, Normalization, Fourier transform, Momentum, Position and momentum operators, Expectation value, Eherenfest's theorem, Uncertainty principle.	**18**
3	**Time-Independent Schrödinger Equation:** Introduction, Method of separation of variables, Stationary states, Hamiltonian, Linear combination, Infinite square well, Harmonic oscillator, Free particle,	**20**

	Delta-function potential, Finite square well, Hydrogen atom.	
4	**Formalism& Mathematical background:** Hilbert space; vectors; Inner product; Linear transformation, Observables; Hermitian operators; Determinate states, Eigenfunctions of a Hermitian operator; Discrete spectra; Continuous spectra, Generalized statistical interpretation, The Uncertainty principle; Proof the generalized uncertainty principle; The Minimal-uncertainty wave packet; The Energy-time uncertainty principle, Dirac notation; Matrix elements; Ket; Bra; Dual space; Projection operator.	**18**
Total		**60**

D. Teaching and Assessment

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

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	**Outline the background and main features of the historical development of quantum mechanics.**	• Lectures. • Tutorials. • Class discussions.	▪ Exams. ▪ Participation. ▪ Discussions.
1.2	**State the historical importance of De Broglie's hypothesis, Schrödinger's wave function, and Born's probabilistic interpretation of the wave function.**	• Lectures. • Tutorials. • Class discussions.	▪ Exams. ▪ Homework. ▪ Quizzes.
1.3	**Describe and solve the Schrödinger equation in the standard one-dimensional examples-infinite and finite square wells, infinite well potentials, free particle, harmonic oscillator, and hydrogen atom.**	• Lectures. • Class discussions. • Tutorials.	▪ Participation. ▪ Exams. ▪ Discussions. ▪ Homework.
1.4	**Define and describe the Hilbert space, Dirac notation, and Basic postulates of Quantum Mechanics.**	• Lectures. • Class discussions. • Tutorials.	▪ Participation. ▪ Exams. ▪ Discussions. ▪ Homework.
2.0	**Skills**		
2.1	**Explain and summarize the basic knowledge gained from studying quantum mechanics.**	• Lectures. • Class discussions. • Tutorials.	▪ Exams. ▪ Discussions. ▪ Participation.
2.2	**Develop the students ability to solve and analyze problems in physics related the topics covered by the course.**	• Problem classes and group tutorial. • Homework assignments as well as problems solutions.	▪ Exams. ▪ Discussions. ▪ Homework.
2.3	**Communicate in a clear and**	• Lectures.	▪ Exams.

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
	concise manner orally, on paper and using IT for acquiring and analyzing information.	• Class discussions. • Tutorials. • Encourage students to use electronic mail and internal network for submitting homework and assignments. • Use digital library.	▪ Participation and activities of students in the course community and blackboard. ▪ Homework.
3.0	**Values**		
3.1	**Show the collaboration and inter-professionalism in class discussions or team works, as well as solve problems independently.**	• Small team tasks • Open discussion at classroom. • Office hours.	▪ Participation. ▪ Homework. ▪ Mini-project.

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	**Class Activities (class quizzes, homework, solving problems, etc.....)**	**weekly**	**10 %**
2	**Midterm Exam 1**	**5thweek**	**25 %**
3	**Midterm Exam 2**	**9thweek**	**25 %**
4	**Final Exam**	**13thweek**	**40 %**

***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 :

- **Students will be assigned an academic advisor to give them the appropriate academic counseling and support.**
- **The lecturer will allocate 6 office hours per week. The assigned times will be advertised on the office door and reserved by the instructor as part of his teaching schedule.**
- **Students are able to get individual consultation appointment with teaching staff via email, phone calls and department website.**

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	Griffiths D.J., ***Introduction to Quantum Mechanics,*** 2nd Edition, Pearson Prentice Hall, NJ, USA(2004).
Essential References Materials	- Gasiorowicz. S., ***Quantum Physics,*** 3rd Edition, Wiley, NJ, USA (2003). - Liboff R.L., ***Introductory Quantum Mechanics,*** Addison Wesley (2002).
Electronic Materials	
Other Learning Materials	-

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	• Each of the class room should be equipped with a whiteboard and a projector.
Technology Resources (AV, data show, Smart Board, software, etc.)	• Classroomsare equipped with data show and Smart Board.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment, Quality of learning resources	• Students • Second assessor	During the semester and at the end of the course each student will complete two evaluation forms.
Extent of achievement of course learning outcomes, Quality of learning resources	• Instructor • Second assessor	At the end of each semester the course instructor should complete the course report, including a summary of student questionnaire responses appraising progress and identifying changes that need to be made if necessary.

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	Quality Unit-Physics Department
Reference No.	Department council No. 11
Date	16/11/2022

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد NCAAA T4 2020

Course Specifications

Course Title:	**Electromagnetic Fields**
Course Code:	**PHY 1321**
Program:	**Bachelor of Science in Physics**
Department:	**Physics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**

Table of Contents

A. Course Identification

1. Credit hours:	**5 (3 Lectures, 0 Lab, 2 Tutorial)**
2. Course type	
a.	University ☐ College ☐ Department ☑ Others ☐
b.	Required ☑ Elective ☐
3. Level/year at which this course is offered:	**Level 7/Year 3**
4.Pre-requisites for this course (if any)**:**	**Electromagnetic Field, PHY 1121 and Calculus (3), MAT 1203.**
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**	**72**	**100%**
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	**48**
2	**Laboratory/Studio**	**0**
3	**Tutorial**	**24**
4	**Others** (specify)	**0**
	Total	**72**

B. Course Objectives and Learning Outcomes

1. Course Description

This course provides the most fundamental concepts of the laws of electromagnetism and their physical characteristics in dielectric and conductive media. It deals with static electric and magnetic fields as well as the properties of conducting dielectric and magnetic materials. It covers the following topics: electrostatics, behavior of matter in electric fields, DC circuits, magnetic fields, and properties of dielectrics and magnetic materials. Faraday's law, AC circuits, and electromagnetic waves. More mathematical techniques are also given using Laplace's, Poisson, Lorentz, Biot-Savart etc. in different dimensions and with boundary conditions to calculate the field more accurately in space and time. Finally it deals with the 4 major Maxwell's equations.

2. Course Main Objective

- **Understand the basic concepts of electric and magnetic fields.**
- **Apply various techniques to electrostatic problems.**
- **Knowledge of the properties of the electric fields in matter.**
- **Understand the magnetic properties of simple current distributions using Biot-Savart and Ampere's laws.**
- **Describe electromagnetic induction and related concepts, and make calculations using Faraday and Lenz's laws.**
- **Include the basic physical content of Maxwell's laws in integral form.**

3. Course Learning Outcomes

CLOs After successful completion of the course, students will able to:		Aligned PLOs
1	**Knowledge and Understanding**	
1.1	**Outline the concepts of electromagnetic vector fields.**	**K1, K2**
1.2	**Describe the basic knowledge of electrostatics, electric potential, energy density and their applications.**	**K1, K2**
1.3	**State the basic understanding of Maxwell's equations and electromagnetic wave propagation.**	**K1, K2**
2	**Skills:**	
2.1	**Explain and summarize the basic knowledge gained from studying electromagnetic fields course.**	**S1, S2**
2.2	**Develop the students ability to solve and analyze problems in physics related the topics covered by the course.**	**S2, S3**
2.3	**Communicate in a clear and concise manner orally, and using IT for acquiring and analyzing information.**	**S4, S5**
3	**Values:**	
3.1	**Show the collaboration and inter-professionalism in class discussions or team works, as well as solve problems independently.**	**V1, V2, V3**

C. Course Content

No	List of Topics	Contact Hours
1	**Vector Analysis**: Scalar Product, Vector Product, Cartesian Coordinates, Circular Cylindrical Coordinates, Spherical Coordinates, Vector Position and Differential Element in Length, Fields, Directional Derivative and Gradient, Line Integral, Surface Integral, Divergence of a Vector, Divergence Theorem, Curl of a Vector, Stockes' Theorem, Conservative Fields, Laplacian of a Scalar.	**14**
2	**Electrostatic Fields:** Coulomb's Law and Field Intensity, Electric Fields due to Continuous Charges Distributions, Electric Flux Density, Gauss's Law-Maxwell's Equation, Electric Potential, Relationship between $\vec{E}$ and V-Maxwell's Equation, Electric Dipole and Flux lines, Energy Density in Electrostatic Fields.	**16**
3	**Electric Fields in Matter:** Properties in Materials, Conductors, Polarization in Dielectrics, Dielectrics Constant and Strength.	**14**

4	**Magnetic Fields in Matter:** Biot-Savart's Law, Ampere's Circuit Law-Maxwell's Equation, Maxwell's Equations for Static Electromagnetic Field, Magnetic Dipole, Magnetization in Materials, Classification of Magnetic Materials, Magnetic Energy.	**14**
5	**Maxwell's Equations and Electromagnetic Wave Propagation:** Faraday's Law, Displacement Current, Maxwell's Equations in Final Forms, Time-Harmonic Fields, Waves in General, Wave Propagation in Lossy Dielectrics, Plane Waves in Lossless Dielectrics, Plane Waves in Free Space, Plane Waves in Good Conductors, Power and the Poynting Vector, Reflection of a Plane Wave at Normal Incidence, Reflection of a Plane Wave at Oblique Incidence.	**14**
Total		**72**

D. Teaching and Assessment

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

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	**Outline the concepts of electromagnetic vector fields.**	• Lectures. • Tutorials. • Class discussions.	▪ Exams. ▪ Participation. ▪ Discussions.
1.2	**Describe the basic knowledge of electrostatics, electric potential, energy density and their applications.**	• Lectures. • Tutorials. • Class discussions.	▪ Exams. ▪ Homework. ▪ Quizzes.
1.3	**State the basic understanding of Maxwell's equations and electromagnetic wave propagation.**	• Lectures. • Class discussions. • Tutorials.	▪ Participation. ▪ Exams. ▪ Discussions. ▪ Homework.
2.0	**Skills**		
2.1	**Explain and summarize the basic knowledge gained from studying electromagnetic fields course.**	• Lectures. • Class discussions. • Tutorials.	▪ Exams. ▪ Discussions. ▪ Participation.
2.2	**Develop the students ability to solve and analyze problems in physics related the topics covered by the course.**	• Problem classes and group tutorial. • Homework assignments as well as problems solutions.	▪ Exams. ▪ Discussions. ▪ Homework.
2.3	**Communicate in a clear and concise manner orally, and using IT for acquiring and analyzing information.**	• Lectures. • Class discussions. • Tutorials. • Encourage students to use electronic mail and internal network for submitting homework and assignments. • Use digital library.	▪ Exams. ▪ Participation and activities of students in the course community and blackboard. ▪ Homework.
3.0	**Values**		
3.1	**Show the collaboration and inter-professionalism in class discussions or team works, as well as solve**	• Small team tasks • Open discussion at classroom.	▪ Participation ▪ Homework. Mini-project(s).

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
	problems independently.	• Office hours.	

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	**Class Activities (class quizzes, homework, solving problems, etc.....)**	**weekly**	**10 %**
2	**Midterm Exam 1**	**5th week**	**25 %**
3	**Midterm Exam 2**	**9th week**	**25 %**
4	**Final Exam**	**13th week**	**40 %**

***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 :

- **Students will be assigned an academic advisor to give them the appropriate academic counseling and support.**
- **The lecturer will allocate 6 office hours per week. The assigned times will be advertised on the office door and reserved by the instructor as part of his teaching schedule.**
- **Students are able to get individual consultation appointment with teaching staff via email, phone calls and department website.**

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	Sadiku M., ***Elements of Electromagnetic***, 2nd Edition, Saunders College (1995).
Essential References Materials	- Nayfeh M.H. and Brussel M.K, ***Electricity and Magnetism,*** John-Wiley & Sons, New York (1985). - Griffiths D. J., ***Introduction to Electrodynamics,*** 3rd Edition, Prentice Hall, N. J, USA (1999).
Electronic Materials	**https://units.imamu.edu.sa/colleges/en/science/Pages/default.aspx**
Other Learning Materials	**Multimedia associated with the text book and the relevant websites.**

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	• **Each of the class room should be equipped with a whiteboard and a projector.**
Technology Resources (AV, data show, Smart Board, software, etc.)	• **Classrooms are equipped with data show and Smart Board.**

Item	Resources
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	

G. Course Quality Evaluation

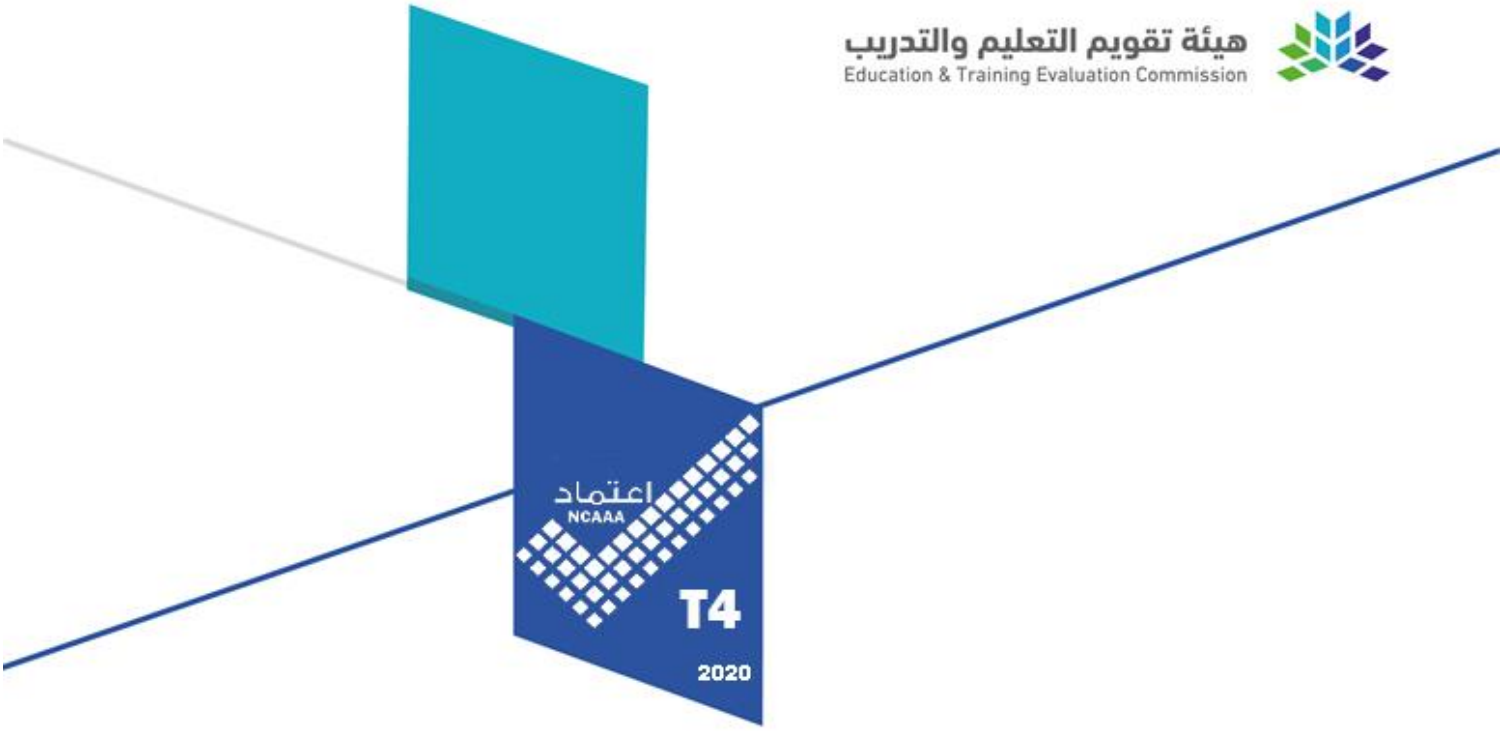
Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment, Quality of learning resources.	• **Students** • **Second assessor**	**During the semester and at the end of the course each student will complete two evaluation forms.**
Extent of achievement of course learning outcomes, Quality of learning resources.	• **Instructor** • **Second assessor**	**At the end of each semester the course instructor should complete the course report, including a summary of student questionnaire responses appraising progress and identifying changes that need to be made if necessary.**

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

H. Specification Approval Data

Council / Committee	**Quality Unit-Physics Department**
Reference No.	**Department council No. 11**
Date	**16/11/2022**

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission



Course Specifications

Course Title:	**Mathematical Physics (2)**
Course Code:	**PHY 1334**
Program:	**Bachelor of Science in Physics**
Department:	**Physics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**

Table of Contents

A. Course Identification

1. Credit hours:	**4 (3 Lectures, 0 Lab, 2 Tutorial)**
2. Course type	
a.	University ☐ College ☐ Department ☑ Others ☐
b.	Required ☑ Elective ☐
3. Level/year at which this course is offered:	**Level 7/Year 3**
4.Pre-requisites for this course (if any)**:**	**Mathematical Physics (1), PHY 1233**
5. Co-requisites for this course (if any)**:**	

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	60	100%
2	Blended		
3	E-learning		
4	Distance learning		
5	Other		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	36
2	Laboratory/Studio	0
3	Tutorial	24
4	Others (specify)	0
	Total	60

B. Course Objectives and Learning Outcomes

This is a course in the applications of mathematics to solutions of physical problems. The mathematical methods covered in this course include partial differentiations, complex variables, partial differential equations, and integral equations. The course will cover some mathematical techniques commonly used in physics. This is not a course in pure mathematics, but rather on the application of mathematics to problems of interest in the physical sciences.

2. Course Main Objective

- **Learn and understand the basic knowledge of mathematical methods used in physics.**
- **Learn and understand the basic knowledge of partial differentiation, complex variables, partial differential equations, and integral equations.**
- **Demonstrate competence with a wide variety of mathematical tools and techniques.**
- **Demonstrate a breadth of general knowledge in mathematical physics as well as depth in topics covered in this course.**
- **Understand the interactions between mathematics and physics and demonstrate the ability to apply mathematical concepts and techniques into problems in physics.**

3. Course Learning Outcomes

CLOs After successful completion of the course, students will able to:		Aligned PLOs
1	**Knowledge and Understanding**	
1.1	**Describe the partial differentiation and its applications.**	**K1, K2**
1.2	**Outline the functions of a complex variable.**	**K1, K2**
1.3	**Recall the basic concepts of the integral equations.**	**K1, K2**
1.4	**Define the basic mathematical tools commonly used in Physics.**	**K1, K2**
2	**Skills:**	
2.1	**Explain and summarize the basic knowledge gained from studying mathematical physics course.**	**S1, S2**
2.2	**Develop the student's ability to solve and analyze problems in physics related the topics covered by the course.**	**S2, S3**
2.3	**Communicate in a clear and concise manner orally, and using IT for acquiring and analyzing information.**	**S4, S5**
3	**Values:**	
3.1	**Show the collaboration and inter-professionalism in class discussions or team works, as well as solve problems independently.**	**V1, V2, V3**

C. Course Content

No	List of Topics	Contact Hours
1	**Partial differentiation:** Definitions, Exact and inexact differentials, Useful theorems, Change of variables, Taylor's theorem for many variable functions, Thermodynamics notation, Differential of integrals.	**18**
2	**Complex Variables:** Definitions and functions of complex variable, Cauchy-Riemann relations, Power series, Some elementary functions, Complex integrals, Cauchy's theorem, Cauchy's integral formula, Taylor and Laurent series, Residue theorem. Application: Complex potential.	**18**
3	**Applications on partial differential equations**: General form and particular solution, Linear second order PDEs, Classification of PDEs. Separation of variables: solution of: Laplace equation – the wave equation- Poisson's equation, Inhomogeneous problems, Integral	**14**

	transform methods. Boundary Value Problems.	
4	**Integral Equations**.	**10**
Total		**60**

D. Teaching and Assessment

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

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	**Describe the partial differentiation and its applications.**	• Lectures. • Tutorials. • Class discussions.	▪ Exams. ▪ Participation. ▪ Discussions.
1.2	**Outline the functions of a complex variable.**	• Lectures. • Tutorials. • Class discussions.	▪ Exams. ▪ Homework. ▪ Quizzes.
1.3	**Recall the basic concepts of the integral equations.**	• Lectures. • Class discussions. • Tutorials.	▪ Participation. ▪ Exams. ▪ Discussions. ▪ Homework.
	Define the basic mathematical tools commonly used in Physics.	• Lectures. • Class discussions. • Tutorials.	▪ Participation. ▪ Exams. ▪ Discussions. ▪ Homework.
2.0	**Skills**		
2.1	**Explain and summarize the basic knowledge gained from studying mathematical physics course.**	• Lectures. • Class discussions. • Tutorials.	▪ Exams. ▪ Discussions. ▪ Participation.
2.2	**Develop the student's ability to solve and analyze problems in physics related the topics covered by the course.**	• Problem classes and group tutorial. • Homework assignments as well as problems solutions.	▪ Exams. ▪ Discussions. ▪ Homework.
2.3	**Communicate in a clear and concise manner orally, on paper and using IT for acquiring and analyzing information.**	• Lectures. • Class discussions. • Tutorials. • Encourage students to use electronic mail and internal network for submitting homework and assignments. • Use digital library.	▪ Exams. ▪ Participation and activities of students in the course community and blackboard. ▪ Homework.
3.0	**Values**		
3.1	**Show the collaboration and inter-professionalism in class discussions or team works, as well as solve problems independently.**	• Small team tasks • Open discussion at classroom. • Office hours.	▪ Participation ▪ Homework's ▪ Mini-project(s).

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Class Activities (class quizzes, homework, solving problems, etc.....)	weekly	10 %
2	Midterm Exam 1	5th week	25 %
3	Midterm Exam 2	9th week	25 %
4	Final Exam	13th week	40 %

***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:

- **Students will be assigned an academic advisor to give them the appropriate academic counseling and support.**
- **The lecturer will allocate 6 office hours per week. The assigned times will be advertised on the office door and reserved by the instructor as part of his teaching schedule.**
- **Students are able to get individual consultation appointment with teaching staff via email, phone calls and department website.**

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	Boas M.L. ***Mathematical Methods in the Physical Sciences***, 3rd Edition, John Wiley (2006).
Essential References Materials	- Arfken G.B. and Weber H.J., ***Mathematical Methods for Physicists***, Academic Press; 6th Edition (2005). -Chow T., ***Mathematical Methods for Physicists: A Concise Introduction***, Cambridge University Press (2000).
Electronic Materials	**https://units.imamu.edu.sa/colleges/en/science/Pages/default.aspx**
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	• **Each of the class room should be equipped with a whiteboard and a projector.**
Technology Resources (AV, data show, Smart Board, software, etc.)	• **Class rooms are equipped with data show and Smart Board.**
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	

G. Course Quality Evaluation

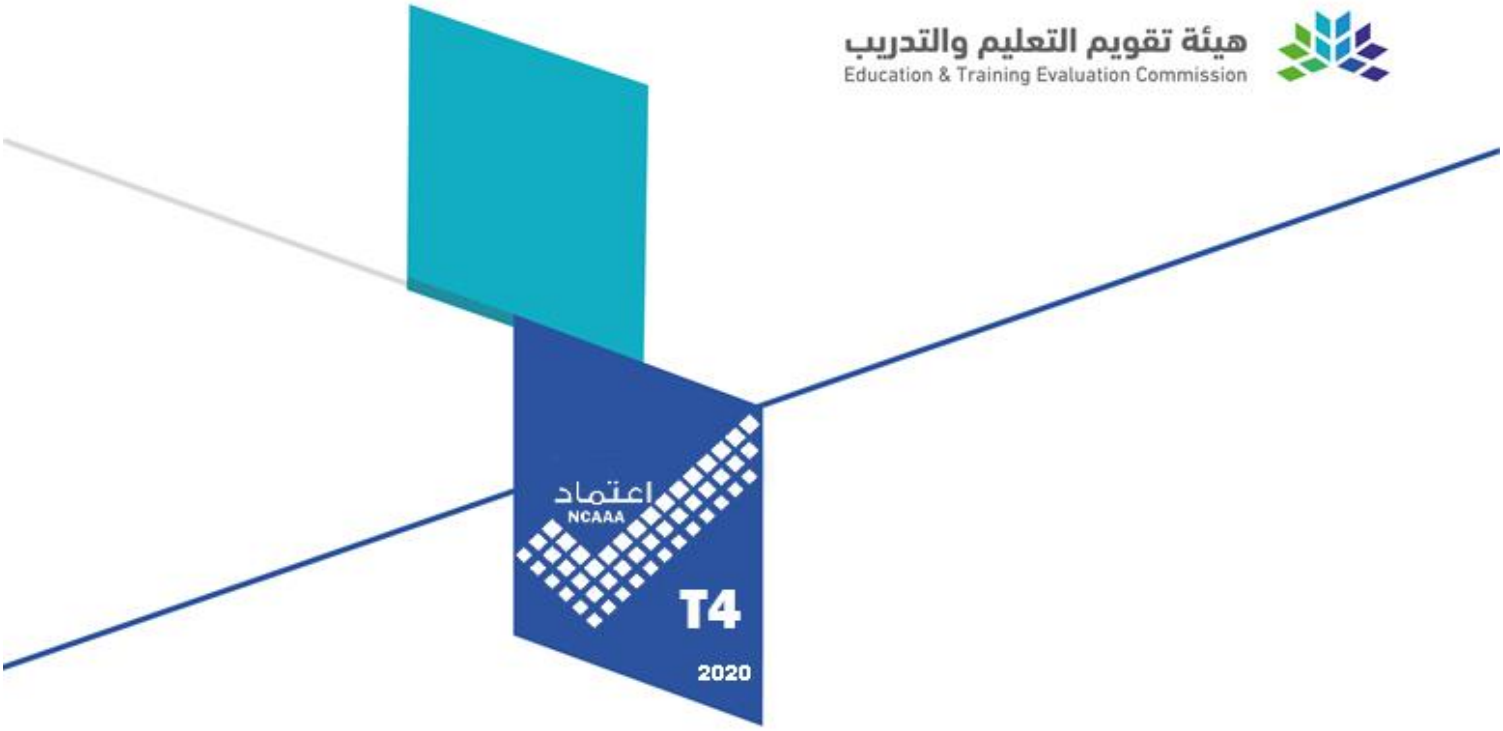
Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment, Quality of learning resources	• Students • Second assessor	During the semester and at the end of the course each student will complete two evaluation forms.
Extent of achievement of course learning outcomes, Quality of learning resources	• Instructor • Second assessor	At the end of each semester the course instructor should complete the course report, including a summary of student questionnaire responses appraising progress and identifying changes that need to be made if necessary.

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

H. Specification Approval Data

Council / Committee	Quality Unit-Physics Department
Reference No.	Department council No. 11
Date	16/11/2022

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission



Course Specifications

Course Title:	**Quantum Mechanics (2)**
Course Code:	**PHY 1313**
Program:	**Bachelor of Science in Physics**
Department:	**Physics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**

Table of Contents

A. Course Identification

1. Credit hours:	**4 (3 Lectures, 0 Lab, 2 Tutorial)**
2. Course type	
a.	University ☐ College ☐ Department ☑ Others ☐
b.	Required ☑ Elective ☐
3. Level/year at which this course is offered:	**Level 8/Year 3**
4.Pre-requisites for this course (if any)**:**	**Quantum Mechanics (1), PHY 1312**
5. Co-requisites for this course (if any)**:**	

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	**60**	**100%**
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	**36**
2	**Laboratory/Studio**	**0**
3	**Tutorial**	**24**
4	**Others** (specify)	**0**
	Total	**60**

B. Course Objectives and Learning Outcomes

1. Course Description

A continuation of PHY 1312 introducing the quantum description of systems with spin and approximation methods. Principles of quantum mechanics will be illustrated by their application to model systems selected from the fields of atomic, solid state, nuclear, and particle physics.

2. Course Main Objective

At the end of this course, students will be able to:

- **Apply the concept of quantum Mechanics to quantitatively predict behavior of the quantum physical systems.**
- **Choose the appropriate mathematical techniques.**
- **Deal with conceptually rich and technically difficult theoretical problems.**
- **Solve through discussion and reading, a wide range of specific theoretical problems, including their backgrounds and implications.**

3. Course Learning Outcomes

CLOs After successful completion of the course, students will able to:		Aligned PLOs
1	**Knowledge and Understanding**	
1.1	**Outline the background and main features of perturbation method.**	**K1, K2**
1.2	**Define and write the WKB Approximation for solving the Eigenvector equation.**	**K1, K2**
1.3	**Explain the Stark and Zeeman effects.**	**K1, K2**
1.4	**Describe the scattering theory.**	**K1, K2**
2	**Skills:**	
2.1	**Explain and summarize the basic knowledge gained from studying the course.**	**S1**
2.2	**Develop the students ability to solve and analyze problems in physics related the topics covered by the course.**	**S1, S3**
2.3	**Communicate in a clear and concise manner orally, and using IT for acquiring and analyzing information.**	**S4, S5**
3	**Values:**	
3.1	**Show the collaboration and inter-professionalism in class discussions or team works, as well as solve problems independently.**	**V1; V2; V3**

C. Course Content

No	List of Topics	Contact Hours
1	**Quantum Mechanics in Three Dimensions:** Introduction, Schrödinger equation in spherical coordinates, Method of separation of variables, Angular equation, Azimuthal quantum number, magnetic quantum number, radial equation, Effective potential, Infinite spherical well, Hydrogen atom, Angular momentum, Eigenvalues, Eigen functions, Spin. Pauli spin matrices, Stern-Gerlach experiment, Addition of angular momenta.	**14**
2	**Time-Independent Perturbation Theory:** Nondegenerate perturbation theory, First-order corrections, Second-order corrections, Degenerate perturbation theory, Fine structure of Hydrogen, Stark effect, Zeeman effect, Hyperfine splitting.	**14**
3	**WKB Approximation:** Classical region, Tunneling, Connection Formulas.	**10**
4	**Time-Dependent Perturbation Theory:** Quantum dynamics, perturbed system, Time-Dependent Perturbation Theory, Two-Level systems, Emission and absorption of radiation, incoherent perturbation, spontaneous emission.	**12**

5	**Scattering:** Introduction, Classical scattering theory, Quantum scattering theory, Partial wave analysis, Phase shifts, Born approximation.	**10**
Total		**60**

D. Teaching and Assessment

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

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	**Outline the background and main features of perturbation method.**	• Lectures. • Tutorials. • Class discussions.	▪ Exams. ▪ Participation. ▪ Discussions.
1.2	**Define and write the WKB Approximation for solving the Eigenvector equation.**	• Lectures. • Tutorials. • Class discussions.	▪ Exams. ▪ Homework. ▪ Quizzes.
1.3	**Explain the Stark and Zeeman effects.**	• Lectures. • Class discussions. • Tutorials.	▪ Participation. ▪ Exams. ▪ Discussions. ▪ Homework.
1.4	**Describe the scattering theory.**	• Lectures. • Class discussions. • Tutorials.	▪ Participation. ▪ Exams. ▪ Discussions. ▪ Homework.
2.0	**Skills**		
2.1	**Explain and summarize the basic knowledge gained from studying the course.**	• Lectures. • Class discussions. • Tutorials.	▪ Exams. ▪ Discussions. ▪ Participation.
2.2	**Develop the students ability to solve and analyze problems in physics related the topics covered by the course.**	• Problem classes and group tutorial. • Homework assignments as well as problems solutions.	▪ Exams. ▪ Discussions. ▪ Homework.
2.3	**Communicate in a clear and concise manner orally, and using IT for acquiring and analyzing information.**	• Lectures. • Class discussions. • Tutorials. • Encourage students to use electronic mail and internal network for submitting homework and assignments. • Use digital library.	▪ Exams. ▪ Participation and activities of students in the course community and blackboard. ▪ Homework.
3.0	**Values**		
3.1	**Show the collaboration and inter-professionalism in class discussions or team works, as well as solve problems independently.**	• Small team tasks • Open discussion at classroom. • Office hours.	▪ Participation. ▪ Homework. ▪ Mini-project(s).

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Class Activities (class quizzes, homework, solving problems, etc.....)	weekly	10 %
2	Midterm Exam 1	5thweek	25 %
3	Midterm Exam 2	9thweek	25 %
4	Final Exam	13thweek	40 %

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

- Students will be assigned an academic advisor to give them the appropriate academic counseling and support.
- The lecturer will allocate 6 office hours per week. The assigned times will be advertised on the office door and reserved by the instructor as part of his teaching schedule.
- Students are able to get individual consultation appointment with teaching staff via email, phone calls and department website.

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	- Griffiths D.J., ***Introduction to Quantum Mechanics***, 2nd Edition, Pearson Prentice Hall, NJ, USA (2004).
Essential References Materials	- Gasiorowicz S., ***Quantum Physics,*** 3rd Edition, Wiley, NJ, USA (2003). - Liboff R.L., ***Introductory Quantum Mechanics,*** Addison Wesley(2002).
Electronic Materials	https://units.imamu.edu.sa/colleges/en/science/Pages/default.aspx
Other Learning Materials	Multimedia associated with the text book and the relevant websites.

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	• Each of the class room should be equipped with a whiteboard and a projector.
Technology Resources (AV, data show, Smart Board, software, etc.)	• Classrooms are equipped with data show and Smart Board.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment, Quality of learning resources.	• Students. • Second assessor.	During the semester and at the end of the course each student will complete two evaluation forms.
Extent of achievement of	• Instructor.	At the end of each semester, the course

Evaluation Areas/Issues	Evaluators	Evaluation Methods
course learning outcomes, Quality of learning resources.	• Second assessor.	instructor should complete the course report, including a summary of student questionnaire responses appraising progress and identifying changes that need to be made if necessary.

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

H. Specification Approval Data

Council / Committee	**Quality Unit-Physics Department**
Reference No.	**Department council No. 11**
Date	**16/11/2022**

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد NCAAA T4 2020

Course Specifications

Course Title:	**Electronics**
Course Code:	**PHY 1324**
Program:	**Bachelor of Science in Physics**
Department:	**Physics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**

Table of Contents

A. Course Identification

1. Credit hours:	**4 (3 Lectures, 0 Lab, 2 Tutorial)**
2. Course type	
a.	University ☐ College ☐ Department ☑ Others ☐
b.	Required ☑ Elective ☐
3. Level/year at which this course is offered:	**Level 8/Year 3**
4.Pre-requisites for this course (if any)**:**	**General Physics (2), PHY 1121 and Mathematical Physics (1), PHY 1233**
5. Co-requisites for this course (if any)**:**	

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	**60**	**100%**
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	**36**
2	**Laboratory/Studio**	**0**
3	**Tutorial**	**24**
4	**Others** (specify)	**0**
	Total	**60**

B. Course Objectives and Learning Outcomes

1. Course Description

This course introduces the characteristics and applications of semiconductor devices and circuits. Emphasis is placed on analysis, selection, biasing, and applications. Upon completion, students should be able to construct, analyze, verify, and troubleshoot analog circuits using appropriate techniques and test equipment. This course covers the concepts, equations and construction of analogue and electronics circuits and it includes amplification, filtering, oscillation, voltage regulation, and other analog circuits. It deals also with semiconductor devices used in industrial applications such as the basic theory, application, and operating characteristics of semiconductor devices.

2. Course Main Objective

- **Understand the basic principles of the circuit theorems.**
- **Develop and enhance the students' knowledge and understanding of the concepts of electronics.**
- **Appreciate the semiconductor technologies and their use in basic circuits.**
- **Get a lot of practical experience in building all kinds of electronic circuits.**

3. Course Learning Outcomes

CLOs After successful completion of the course, students will able to:		Aligned PLOs
1	**Knowledge and Understanding**	
1.1	**Define key electrical concepts-current, voltage, and resistance.**	**K1, K2**
1.2	**State the basic scientific principles of electrical and electronic devices.**	**K1, K2**
1.3	**Describe the characteristics, operation and application of a broad range of electronic components, devices and equipment.**	**K1, K2**
1.4	**Outline formulates for solving electronic problems and analyzing electronic circuits.**	**K1, K2**
2	**Skills:**	
2.1	**Explain and summarize the basic knowledge gained from studying electronics course.**	**S1, S2**
2.2	**Develop the students ability to solve and analyze problems in physics related the topics covered by the course.**	**S2, S3**
2.3	**Communicate in a clear and concise manner orally, on paper and using IT for acquiring and analyzing information.**	**S4, S5**
3	**Values:**	
3.1	**Show the collaboration and inter-professionalism in class discussions or team works, as well as solve problems independently.**	**V1, V2, V3**

C. Course Content

No	List of Topics	Contact Hours
1	**AC Fundamentals:** The Sine wave –Average and RMS values–The J operator – Polar and rectangular forms of complex numbers – Phasor diagram – Complex impedance and admittance- Concept of voltage and current sources – KVL and KCL- Application to AC circuits R, C, L, RL, RC, RLC - Resonance: Series resonance and parallel resonance RLC circuits.	8
2	**Introduction to Semiconductor:** Atomic structure, semiconductors, conductor, Insulators, conduction in semiconductor, Pure semiconductor, recombination of electrons and holes Intrinsic and extrinsic semiconductors, N and P- type semiconductors, Mobility, Drift Velocity, Energy band gap. The potential barrier, Work function, Different type of electron emission, Applications of continuity equation for the study of junction behavior – Avalanche and zener breakdown.	8
3	**PN Junction:** Depletion region – Junction capacitance – Diode equation (no derivation) – Effect of temperature on reverse saturation current – construction, working, V-I characteristics and simple applications of: Junction diode, Zener diode, Tunnel diode and Varactor diode. Filter considerations.	8
4	**Rectifiers:** Half wave and full wave and bridge rectifiers - power, efficiency and ripple factor for half wave and full wave rectifiers, Regulation – Harmonic components in rectified output.	6

5	**Silicon Controlled Rectifier (SCR):** Structure and working of SCR. Two transistor representation, Characteristics of SCR. Application of SCR for power control.	4
6	**Bipolar Junction Transistor (BJT):** PNP and NPN transistors–current components in BJT – BJT static characteristics (Input and Output) – Early effect- CB, CC, CE configurations (cut off, active, and saturation regions) CE configuration as two port network – Alpha and Beta of a transistor, Biasing and load line analysis – Fixed bias and self-bias arrangement. Transistor action, Transistor as an amplifier, Operating point, Load line, expressions for current gain, voltage gain, input impedance, output impedance and power gain. Power amplifier - power BJT - Thermal resistance - Maximum power- Class A, Class B, Class AB and Class C amplifiers -Basic operational amplifier- Differential amplifier.	8
7	**Operational Amplifier fundamentals:** Characteristics – OpAmp parameters - inverting amplifier-non-inverting amplifier - unity follower - summing amplifier- difference amplifier. Differentiator, integrator, comparator using OP-Amps.	5
8	**Field Effect Transistor (FET):** Field-Effect Transistors (FET): Construction and classification, Principle of operation, Characteristic curves, Characteristic parameters of the FET, Effect of temperature on FET, Common source amplifier, Common drain amplifier, Classification of MOSFET & UJT. Application of FET as voltage variable resistor and MOSFET as a switch – Advantages of FET over transistor.	5
9	**Optoelectronic Devices:** Structure and operation of PN photodiode, Phototransistor, Solar cell, Photoconductive cell, Photovoltaic, Sensors, LED, LCD, Alphanumeric display.	4
10	**Digital Electronics:** Introduction to number systems, Logic gates OR, AND, NOT, X-OR, NAND, NOR gates - Truth tables – Positive and negative logic – Logic families and their characteristics – RTL, DTL, ECL, TTL and CMOS- Universal building blocks NAND and NOR gates.	4
Total		**60**

D. Teaching and Assessment

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

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	**Define key electrical concepts-current, voltage, and resistance.**	• Lectures. • Tutorials. • Class discussions.	▪ Exams. ▪ Participation. ▪ Discussions.
1.2	**State the basic scientific principles of electrical and electronic devices.**	• Lectures. • Tutorials. • Class discussions.	▪ Exams. ▪ Homework. ▪ Quizzes.
1.3	**Describe the characteristics, operation and application of a broad range of electronic components, devices and equipment.**	• Lectures. • Class discussions. • Tutorials.	▪ Participation. ▪ Exams. ▪ Discussions. ▪ Homework.
1.4	**Outline formulates for solving electronic problems and analyzing electronic circuits.**	• Lectures. • Class discussions. • Tutorials.	▪ Participation. ▪ Exams. ▪ Discussions. ▪ Homework.
2.0	**Skills**		
2.1	**Explain and summarize the basic knowledge gained from studying electronics course.**	• Lectures. • Class discussions. • Tutorials.	▪ Exams. ▪ Discussions. ▪ Participation.
2.2	**Develop the student's ability to solve and analyze problems in**	• Problem classes and group tutorial.	▪ Exams. ▪ Discussions.

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
	physics related the topics covered by the course.	• Homework assignments as well as problems solutions.	▪ Homework.
2.3	**Communicate in a clear and concise manner orally, and using IT for acquiring and analyzing information.**	• Lectures. • Class discussions. • Tutorials. • Encourage students to use electronic mail and internal network for submitting homework and assignments. • Use digital library.	▪ Exams. ▪ Participation and activities of students in the course community and blackboard. ▪ Homework.
3.0	**Values**		
3.1	**Show the collaboration and inter-professionalism in class discussions or team works, as well as solve problems independently.**	• Small team tasks • Open discussion at classroom. • Office hours.	▪ Participation ▪ Homework's ▪ Mini-project(s).

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	**Class Activities (class quizzes, homework, solving problems, etc.....)**	**weekly**	**10 %**
2	**Midterm Exam 1**	**5thweek**	**25 %**
3	**Midterm Exam 2**	**9thweek**	**25 %**
4	**Final Exam**	**13thweek**	**40 %**

***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:

- **Students will be assigned an academic advisor to give them the appropriate academic counseling and support.**
- **The lecturer will allocate 6 office hours per week. The assigned times will be advertised on the office door and reserved by the instructor as part of his teaching schedule.**
- **Students are able to get individual consultation appointment with teaching staff via email, phone calls and department website.**

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	Floyd T. L., ***Electronic Devices, Prentice Hall***,9th Edition (2011).
Essential References Materials	- Horowitz P. and Hill W., ***The Art of Electronics, Cambridge University Press,*** 2nd Edition (1989). - Boylestad R.L. and Nashelsky L., ***Electronic Devices and Circuit Theory,*** Pearson Education (2005).
Electronic Materials	**https://units.imamu.edu.sa/colleges/en/science/Pages/default.aspx**
Other Learning Materials	**Multimedia associated with the text book and the relevant websites.**

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	• **Each of the class room should be equipped with a whiteboard and a projector.**
Technology Resources (AV, data show, Smart Board, software, etc.)	• **Class rooms are equipped with data show and Smart Board.**
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment, Quality of learning resources.	• **Students** • **Second assessor**	**During the semester and at the end of the course each student will complete two evaluation forms.**
Extent of achievement of course learning outcomes, Quality of learning resources.	• **Instructor** • **Second assessor**	**At the end of each semester the course instructor should complete the course report, including a summary of student questionnaire responses appraising progress and identifying changes that need to be made if necessary.**

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

H. Specification Approval Data

Council / Committee	Quality Unit-Physics Department
Reference No.	Department council No. 11
Date	16/11/2022

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

Course Specifications

Course Title:	**Statistical physics**
Course Code:	**PHY 1332**
Program:	**Bachelor of Science in Physics**
Department:	**Physics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**

Table of Contents

A. Course Identification

1. Credit hours:	**4 (3 Lectures, 0 Lab, 2 Tutorial)**
2. Course type	
a.	University ☐ College ☐ Department ☑ Others ☐
b.	Required ☑ Elective ☐
3. Level/year at which this course is offered:	**Level 8/Year 3**
4.Pre-requisites for this course (if any)**:**	**Thermal Physics, PHY 1230 and Quantum Mechanics (1), PHY 1312**
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	60	100%
2	Blended		
3	E-learning		
4	Distance learning		
5	Other		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	36
2	Laboratory/Studio	0
3	Tutorial	24
4	Others (specify)	0
	Total	60

B. Course Objectives and Learning Outcomes

1. Course Description

This course presents the mathematics and quantum mechanics needed to understand statistical thermodynamics. It covers several important topics, including a mathematically sound presentation of statistical thermodynamics; the kinetic theory of gases including transport processes; and thorough, modern treatment of the thermodynamics of magnetism.

2. Course Main Objective

At the end of the course, students will be able to:

- **Define and discuss the concepts of macro state and microstate of a model system.**
- **Discuss the Boltzmann distribution and the role of the partition function.**
- **Define the Fermi-Dirac and Bose-Einstein distributions; state where they are applicable; understand how they differ and show when they reduce to the Boltzmann distribution.**
- **Apply the Fermi-Dirac distribution to the calculation of thermal properties of electrons in metals.**
- **Apply the Bose-Einstein distribution to the calculation of properties of black body radiation.**

3. Course Learning Outcomes

	CLOs After successful completion of the course, students will able to:	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	**Outline the Laws of thermodynamics and understand their statistical foundations.**	**K1, K2**
1.2	**Demonstrate the basic knowledge of the classical statistics of Maxwell-Boltzmann.**	**K1, K2**
1.3	**Define the quantum statistical physics of Fermions and Bosons.**	**K1, K2**
1.4	**State the basic concepts of the heat capacity of a diatomic gas.**	**K1, K2**
1.5	**Describe the treatment of the thermodynamics of magnetism.**	**K1, K2**
2	**Skills:**	
2.1	**Explain and summarize the basic knowledge gained from studying mathematical physics course.**	**S1, S2**
2.2	**Develop the student's ability to solve and analyze problems in physics related the topics covered by the course.**	**S2, S3**
2.3	**Communicate in a clear and concise manner orally, and using IT for acquiring and analyzing information.**	**S4, S5**
3	**Values:**	
3.1	**Show the collaboration and inter-professionalism in class discussions or team works, as well as solve problems independently.**	**V1, V2, V3**

C. Course Content

No	List of Topics	Contact Hours
1	**Statistical Thermodynamics:** Coin-tossing experiment. System of distinguishable particles. Thermodynamic probability and entropy. Quantum states and energy levels. Density of quantum states.	**8**
2	**Classical Statistics of Maxwell-Boltzmann:** Boltzmann statistics. The Boltzmann distribution. Partition function. Dilute gases and the Maxwell-Boltzmann distribution. The connection between classical and statistical thermodynamics. Thermodynamic properties from the partition function. Partition function for a gas. Properties of a monatomic ideal gas. Applicability of the Maxwell-Boltzmann distribution. Distribution of	**12**

	molecular speeds. Equipartition of energy.	
3	**Quantum statistics:** The Fermi-Dirac distribution. The Bose-Einstein distribution. Comparison of the distributions.	**10**
4	**Bose-Einstein and Fermi-Dirac Gases:** Blackbody radiation and properties of a photon gas. Bose-Einstein condensation. Properties of a boson gas. Application to liquid helium. The Fermi energy. The calculation of the chemical potential. Free electrons in a metal. Properties of a fermion gas. Application to white dwarf stars.	**12**
5	**The heat Capacity of a diatomic gas and of a solid:** The quantized linear oscillator. Vibrational modes of diatomic molecules. Rotational modes of diatomic molecules. Electronic excitation. The total heat capacity. Einstein theory of the heat capacity of a solid. Debye's theory of the heat capacity of a solid.	**10**
6	**The Thermodynamic of Magnetism:** Para magnetism. Properties of a spin ½ paramagnet. Adiabatic demagnetization. Negative temperature. Ferromagnetism.	**8**
Total		**60**

D. Teaching and Assessment

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

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	**Outline the Laws of thermodynamics and understand their statistical foundations.**	• Lectures. • Tutorials. • Class discussions.	▪ Exams. ▪ Participation. ▪ Discussions.
1.2	**Demonstrate the basic knowledge of the classical statistics of Maxwell-Boltzmann.**	• Lectures. • Tutorials. • Class discussions.	▪ Exams. ▪ Homework. ▪ Quizzes.
1.3	**Define the quantum statistical physics of Fermions and Bosons.**	• Lectures. • Class discussions. • Tutorials.	▪ Participation. ▪ Exams. ▪ Discussions. ▪ Homework.
1.4	**State the basic concepts of the heat capacity of a diatomic gas.**	• Lectures. • Tutorials. • Class discussions.	▪ Exams. ▪ Homework. ▪ Quizzes.
1.5	**Describe the treatment of the thermodynamics of magnetism.**	• Lectures. • Class discussions. • Tutorials.	▪ Exams. ▪ Participation. ▪ Discussions.
2.0	**Skills**		
2.1	**Explain and summarize the basic knowledge gained from studying mathematical physics course.**	• Lectures. • Class discussions. • Tutorials.	▪ Exams. ▪ Discussions. ▪ Participation.
2.2	**Develop the students ability to solve and analyze problems in physics related the topics covered by the course.**	• Problem classes and group tutorial. • Homework assignments as well as problems solutions.	▪ Exams. ▪ Discussions. ▪ Homework's.

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
2.3	**Communicate in a clear and concise manner orally, on paper and using IT for acquiring and analyzing information.**	• Lectures. • Class discussions. • Tutorials. • Encourage students to use electronic mail and internal network for submitting homework and assignments. • Use digital library.	▪ Exams. ▪ Participation and activities of students in the course community and blackboard. ▪ Homework's.
3.0	**Values**		
3.1	**Show the collaboration and inter-professionalism in class discussions or team works, as well as solve problems independently.**	• Small team tasks • Open discussion at classroom. • Office hour guiding.	▪ Participation ▪ Homework's ▪ Mini-project(s).

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	**Class Activities (class quizzes, homework, solving problems, etc.....)**	**weekly**	**10 %**
2	**Midterm Exam 1**	**5thweek**	**25 %**
3	**Midterm Exam 2**	**9thweek**	**25 %**
4	**Final Exam**	**13thweek**	**40 %**

***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 :

- **Students will be assigned an academic advisor to give them the appropriate academic counseling and support.**
- **The lecturer will allocate 6 office hours per week. The assigned times will be advertised on the office door and reserved by the instructor as part of his teaching schedule.**
- **Students are able to get individual consultation appointment with teaching staff via email, phone calls and department website.**

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	Asheley H. Carter, ***Classical and Statistical Thermodynamics,*** Prentise Hall (2000).
Essential References Materials	
Electronic Materials	**www.imamm.org**
Other Learning Materials	- Lokanathan S. and Gambhir R.S., ***Statistical and Thermal Physics: an introduction,*** P. H. I. (1991). - Patharia R. K., ***Statistical Mechanics,*** Oxford: Butterworth (1996). - Mandel F., ***Statistical Physics,*** 2nd Edition, John Wiley (1988).

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	• **Each of the class room should be equipped with a whiteboard and a projector.**
Technology Resources (AV, data show, Smart Board, software, etc.)	• **Class rooms are equipped with data show and Smart Board.**
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment, Quality of learning resources	• **Students** • **Second assessor**	**During the semester and at the end of the course each student will complete two evaluation forms.**
Extent of achievement of course learning outcomes, Quality of learning resources	• **Instructor** • **Second assessor**	**At the end of each semester the course instructor should complete the course report, including a summary of student questionnaire responses appraising progress and identifying changes that need to be made if necessary.**

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

H. Specification Approval Data

Council / Committee	Quality Unit-Physics Department
Reference No.	Department council No. 11
Date	16/11/2022

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد NCAAA T4 2020

Course Specifications

Course Title:	**Atomic Physics**
Course Code:	**PHY 1362**
Program:	**Bachelor of Science in Physics**
Department:	**Physics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**

Table of Contents

A. Course Identification

1. Credit hours:	**4 (3 Lectures, 0 Lab, 2 Tutorial)**
2. Course type	
a.	University ☐ College ☐ Department ☑ Others ☐
b.	Required ☑ Elective ☐
3. Level/year at which this course is offered:	**Level 9/Year 3**
4.Pre-requisites for this course (if any)**:**	**Quantum Mechanics (2), PHY 1313**
5. Co-requisites for this course (if any)**:**	

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	**60**	**100%**
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	**36**
2	**Laboratory/Studio**	**0**
3	**Tutorial**	**24**
4	**Others** (specify)	**0**
	Total	**60**

B. Course Objectives and Learning Outcomes

1. Course Description

Using the quantum approach to the subject of atomic physics, this course keeps the mathematics to the minimum needed for a clear and comprehensive understanding of the material. Beginning with an introduction and treatment of atomic structure, the course goes on to deal with quantum mechanics, atomic spectra and the theory of interaction between atoms and radiation. This course covers the following topics: the hydrogen atom, the hydrogen atom-fine structure, two-electron atoms, many-electron atoms, interaction with static external fields, interaction with static external fields, and hyperfine structure.

2. Course Main Objective

- **Understand the concepts of a good quantum number and simultaneous observability.**
- **Understand the quantum numbers, including their physical significance, and quantum mechanical states of the hydrogen atom.**
- **Understand time independent perturbation theory including its derivation and be able to apply it to simple systems, including the Stark-Effect and Zeeman Effect.**
- **Know about the origins of fine structure in atomic spectra.**
- **Understand the exchange degeneracy and how this affects the excited states of helium.**
- **Understand the Periodic table from the viewpoint of the electronic structure.**
- **Understand and be able to apply to simple cases time dependent perturbation theory.**
- **Understand the derivation of and be able to apply the selection rules for the interaction of electric dipole radiation and atoms.**

3. Course Learning Outcomes

	CLOs After successful completion of the course, students will able to:	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	State the basic principles of quantum mechanics in the physics of atoms.	K1, K2
1.2	Describe the basic concepts related to atomic structure and atomic features.	K1, K2
1.3	Outline the basic concepts of interaction between atom and electric and magnetic field.	K1, K2
2	**Skills:**	
2.1	Explain and summarize the basic knowledge gained from studying mathematical physics course.	S1, S2
2.2	Develop the students ability to solve and analyze problems in physics related the topics covered by the course.	S2, S3
2.3	Communicate in a clear and concise manner orally, and using IT for acquiring and analyzing information.	S4, S5
3	**Values:**	
3.1	Show the collaboration and inter-professionalism in class discussions or team works, as well as solve problems independently.	V1, V2, V3

C. Course Content

No	List of Topics	Contact Hours
1	**The hydrogen atom:** The Schrödinger equation, Stationary states, Expectation values, Solution of Schrödinger's equation for a Coulomb field, The quantum numbers ℓ and m_ℓ, The hydrogen energy spectrum.	12
2	**The hydrogen atom-fine structure:** Electron spin, The interaction	10

	terms, The vector model, The Lamb shift.	
3	**Two-electron atoms:** Electrostatic interaction and exchange degeneracy, The ground state of helium, The excited states of helium, Electron spin functions and the Pauli exclusion principle, The periodic system.	**10**
4	**Many-electron atoms:** The central field, Thomas-Fermi potential, The LS coupling approximation, allowed terms in LS coupling, Fine structure in LS coupling, The j-j coupling approximation.	**10**
5	**Interaction with static external fields:** Zeeman effect in LS coupling, Quadratic Stark effect, Linear Stark effect.	**8**
6	**Hyperfine structure:** Magnetic dipole interaction, Determination of nuclear spin from magnetic hyperfine structure, Determination of μ_I from magnetic hyperfine structure, Magnetic hyperfine structure in two-electron spectra, Electric quadrupole interaction, Zeeman effect of hyperfine structure.	**10**
Total		**60**

D. Teaching and Assessment

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

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	**State the basic principles of quantum mechanics in the physics of atoms.**	• Lectures. • Tutorials. • Class discussions.	▪ Exams. ▪ Participation. ▪ Discussions.
1.2	**Describe the basic concepts related to atomic structure and atomic features.**	• Lectures. • Tutorials. • Class discussions.	▪ Exams. ▪ Homework. ▪ Quizzes.
1.3	**Outline the basic concepts of interaction between atom and electric and magnetic field.**	• Lectures. • Class discussions. • Tutorials.	▪ Participation. ▪ Exams. ▪ Discussions. ▪ Homework.
2.0	**Skills**		
2.1	**Explain and summarize the basic knowledge gained from studying mathematical physics course.**	• Lectures. • Class discussions. • Tutorials.	▪ Exams. ▪ Discussions. ▪ Participation.
2.2	**Develop the students ability to solve and analyze problems in physics related the topics covered by the course.**	• Problem classes and group tutorial. • Homework assignments as well as problems solutions.	▪ Exams. ▪ Discussions. ▪ Homework.
2.3	**Communicate in a clear and concise manner orally, and using IT for acquiring and analyzing information.**	• Lectures. • Class discussions. • Tutorials. • Encourage students to use electronic mail and internal network for submitting homework and assignments.	▪ Exams. ▪ Participation and activities of students in the course community and blackboard. ▪ Homework.

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
		• Use digital library.	
3.0	**Values**		
3.1	**Show the collaboration and inter-professionalism in class discussions or team works, as well as solve problems independently.**	• Small team tasks • Open discussion at classroom. • Office hours.	▪ Participation ▪ Homework's ▪ Mini-project(s).

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	**Class Activities (class quizzes, homework, solving problems, etc.....)**	**weekly**	**10 %**
2	**Midterm Exam 1**	**5th week**	**25 %**
3	**Midterm Exam 2**	**9th week**	**25 %**
4	**Final Exam**	**13th week**	**40 %**

***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 :

- **Students will be assigned an academic advisor to give them the appropriate academic counseling and support.**
- **The lecturer will allocate 6 office hours per week. The assigned times will be advertised on the office door and reserved by the instructor as part of his teaching schedule.**
- **Students are able to get individual consultation appointment with teaching staff via email, phone calls and department website.**

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	Woodgate G. K., ***Elementary Atomic Structure,*** McGraw-Hill (1983).
Essential References Materials	- Jones D. G. C. ***Atomic Physics,*** Chapman and Hall (1997). - Foot C.J., ***Atomic Physics,*** Oxford (2005).
Electronic Materials	**https://units.imamu.edu.sa/colleges/en/science/Pages/default.aspx**
Other Learning Materials	**Multimedia associated with the text book and the relevant websites.**

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	• Each of the class room should be equipped with a whiteboard and a projector.
Technology Resources (AV, data show, Smart Board, software, etc.)	• Classrooms are equipped with data show and Smart Board.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment, Quality of learning resources.	• Students • Second assessor	During the semester and at the end of the course each student will complete two evaluation forms.
Extent of achievement of course learning outcomes, Quality of learning resources.	• Instructor • Second assessor	At the end of each semester the course instructor should complete the course report, including a summary of student questionnaire responses appraising progress and identifying changes that need to be made if necessary.

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

H. Specification Approval Data

Council / Committee	Quality Unit-Physics Department
Reference No.	Department council No. 11
Date	16/11/2022

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد NCAAA T4 2020

Course Specifications

Course Title:	**Electronics Laboratory**
Course Code:	**PHY 1382**
Program:	**Bachelor of Science in Physics**
Department:	**Physics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**

Table of Contents

A. Course Identification

1. Credit hours:	**2 (0 Lectures, 2 Lab, 2 Tutorial)**
2. Course type	
a.	University ☐ College ☐ Department ☑ Others ☐
b.	Required ☑ Elective ☐
3. Level/year at which this course is offered:	**Level 9/Year 3**
4.Pre-requisites for this course (if any)**:**	**Electronics, PHY 1324**
5. Co-requisites for this course (if any)**:**	

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	**48**	**100%**
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	**0**
2	**Laboratory/Studio**	**24**
3	**Tutorial**	**24**
4	**Others** (specify)	**0**
	Total	**48**

B. Course Objectives and Learning Outcomes

1. Course Description

This laboratory course is designed to provide students with fundamental concepts of Electronic Circuits for lab experience. Emphasis is placed on analysis, selection, biasing, and applications. Upon completion, students should be able to construct, analyze, verify, and troubleshoot analog circuits using appropriate techniques and test equipment. Every class will have a short lecture introducing the procedures, concepts, formulas and instructions relevant to the experiment. The lecture will also cover what is expected in the lab-report; don't be late. Attendance and participation is mandatory. Experiments will usually be performed in groups, but each student will turn in an individual lab report.

2. Course Main Objective

- **Observe and analyze physical data relevant to some of the experiments in electronics.**
- **Provide students with a thorough understanding of the basic concepts of physics and the methods scientists use to explore natural phenomena, including observation, hypothesis development, measurement and data collection, experimentation, evaluation of evidence, and employment of mathematical analysis.**
- **Develop the student's mathematical ability to manipulate formulae and derive correct numerical solutions that can be measured in the real world.**
- **Instruct students in the competent use of laboratory equipment to collect and record data, apply relevant mathematical models and perform required computations, and present the derived results as an application of a measured observation of the physical world.**

3. Course Learning Outcomes

CLOs After successful completion of the course, students will able to:		Aligned PLOs
1	**Knowledge and Understanding**	
1.1	**Recognize the scientific method of inquiry to draw conclusions based on verifiable evidence such as semiconducting p-n junctions and its characteristics.**	**K1;K2**
1.2	**Describe the theoretical bases of transformation the alternative voltage (ac) to direct voltage (dc) using the rectification behavior of the diodes and their various circuits experiments.**	**K1;K2**
1.3	**Define the theoretical bases of voltage regulation using Zener diodes and their electrical, electronic circuits' experiments and bipolar transistor characteristics experiments.**	**K1;K2**
2	**Skills:**	
2.1	**Analyze experiments according to the plan besides the learning from lab lecture.**	**S1; S2**
2.2	**Explain and use information from the output of experiment to draw conclusions.**	**S2; S3**
2.3	**Summarize conclusions and write reports.**	**S3; S4**
2.4	**Communicate in a clear and concise manner orally, and using IT for acquiring and analyzing information.**	**S4; S5**
3	**Values:**	
3.1	**Show the collaboration and inter-professionalism in class discussions or team works, as well as solve problems independently.**	**V1; V2; V3**

C. Course Content

No	List of Topics	Contact Hours
1	**Introduction.**	**6**
2	**Experiment 1:** Recording the current-Voltage characteristic of a diode.	**4**
3	**Experiment 2:** Half-wave rectifier circuit.	**4**
4	**Experiment 3:** Full-wave rectifier circuit	**4**
5	**Experiment 4:** Capacitor filter circuit.	**4**

6	**Revision.**	**0**
7	**Experiment 5:** Zener-diode characteristics.	**4**
8	**Experiment 6:** Voltage stabilization with Zener diode.	**4**
9	**Experiment 7:** Bipolar transistor characteristics.	**4**
10	**Experiment 8:** Field Effect Transistor (FET).	**4**
11	**Revision.**	**6**
Total		**48**

D. Teaching and Assessment

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

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	**Recognize the scientific method of inquiry to draw conclusions based on verifiable evidence such as semiconducting p-n junctions and its characteristics.**	• Supervision by lab instructor • Submitting an individual lab report. • Performing lab. experiments at the scheduled times.	▪ Participation. ▪ Report evaluation. ▪ Lab experiment check. ▪ Exams.
1.2	**Describe the theoretical bases of transformation the alternative voltage (ac) to direct voltage (dc) using the rectification behavior of the diodes and their various circuits experiments.**	• Supervision by lab instructor • Submitting an individual lab report. • Performing lab. experiments at the scheduled times.	▪ Discussion. ▪ Report evaluation. ▪ Lab experiment check. ▪ Exams.
1.3	**Define the theoretical bases of voltage regulation using Zener diodes and their electrical, electronic circuits experiments and bipolar transistor characteristics experiments.**	• Supervision by lab instructor • Submitting an individual lab report. • Performing lab. experiments at the scheduled times.	▪ Participation. ▪ Report evaluation. ▪ Lab experiment check. ▪ Exams.
2.0	**Skills**		
2.1	**Analyze experiments according to the plan besides the learning from lab lecture.**	• Using the multimedia and visual materials, Lab manual and the theoretical bases of the course. • Interaction between students in the lab course community and discussions in the lab.	▪ Participation. ▪ Lab experiment check.
2.2	**Explain and use information from the output of experiment to draw conclusions.**	• Experiments setting up, data recording and calculations based on lab manual and lectures (co-requisites).	▪ Compare with standard results. ▪ Feedback and explanations.

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
2.3	**Summarize conclusions and write reports.**	• Experiments setting up, data recording and calculations based on lab manual and lectures (co-requisites).	▪ Compare with standard results. ▪ Feedback and explanations.
2.4	**Communicate in a clear and concise manner orally, and using IT for acquiring and analyzing information.**	• Lectures. • Class discussions. • Encourage students to use electronic mail and internal network for submitting homework and assignments. • Use digital library.	▪ Exams. ▪ Participation and activities of students in the course community and blackboard. ▪ Feedback and explanations.
3.0	**Values**		
3.1	**Show the collaboration and inter-professionalism in class discussions or team works, as well as solve problems independently.**	• Small team tasks • Open discussion at classroom. • Office hours.	▪ Reports. ▪ Presentations. ▪ Participation.

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	**Lab Activities (Lab quizzes, reports, homework, solving problems, etc.....)**	**Weekly**	**35 %**
2	**Midterm Exam 1**	**5th week**	**7.5 %**
3	**Midterm Exam 2**	**9thweek**	**7.5 %**
4	**Final Exam**	**13thweek**	**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:

- **Students will be assigned an academic advisor to give them the appropriate academic counseling and support.**
- **The lecturer will allocate 4 office hours per week. The assigned times will be advertised on the office door and reserved by the instructor as part of his teaching schedule.**
- **Students are able to get individual consultation appointment with teaching staff via email, phone calls and department website.**

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	
Essential References Materials	
Electronic Materials	**https://units.imamu.edu.sa/colleges/en/science/Pages/default.aspx**
Other Learning Materials	- Laboratory Manual supplied by the Department of Physics. - Laboratory Manual is available at the website of the Department of Physics.

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	• **Each of the class room should be equipped with a whiteboard and a projector.** • **Each class room should be equipped with max 25 seat.**
Technology Resources (AV, data show, Smart Board, software, etc.)	• **Classrooms are equipped with data show and Smart Board, and internet connection.**
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	**See attached file**

G. Course Quality Evaluation

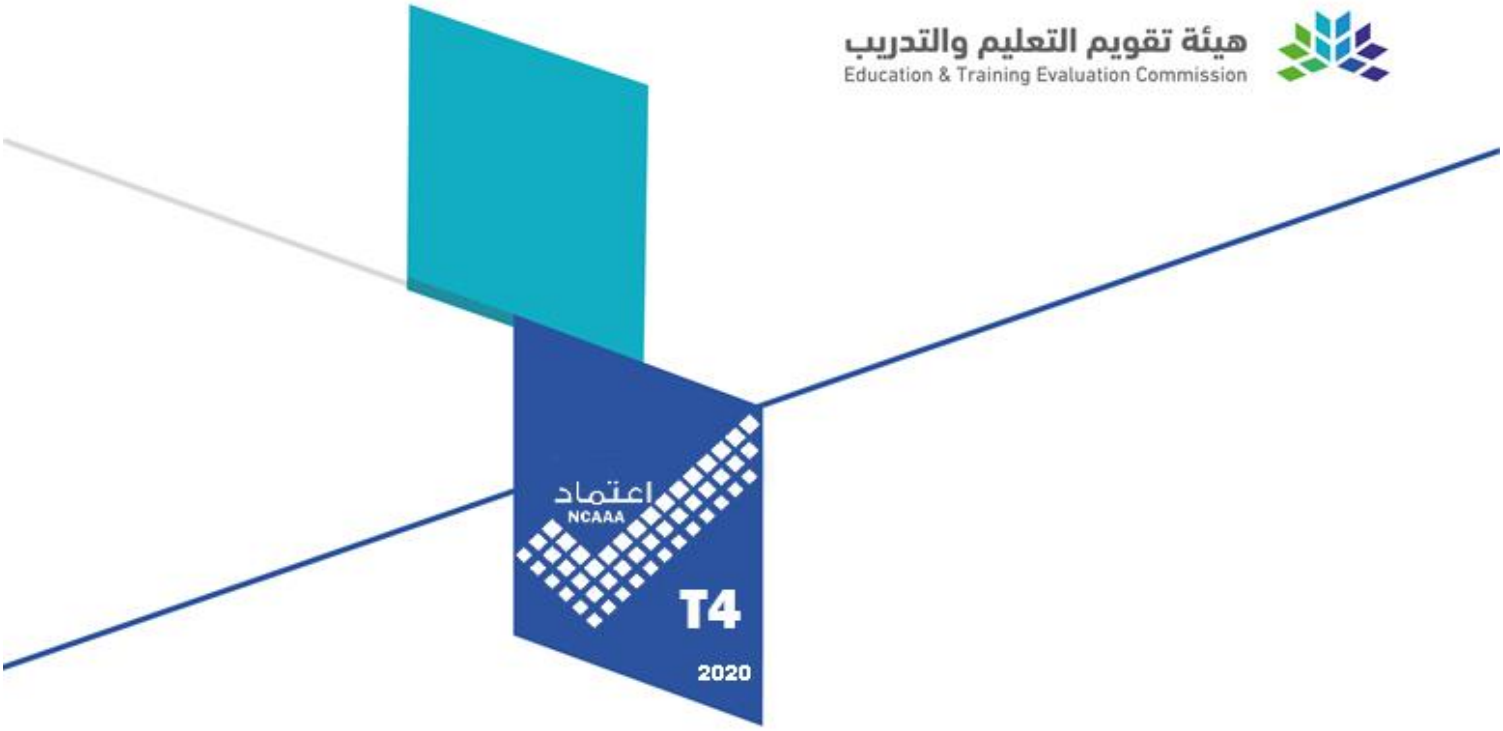
Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment, Quality of learning resources.	• **Students** • **Second assessor**	**During the semester and at the end of the course each student will complete two evaluation forms.**
Extent of achievement of course learning outcomes, Quality of learning resources.	• **Instructor** • **Second assessor**	**At the end of each semester the course instructor should complete the course report, including a summary of student questionnaire responses appraising progress and identifying changes that need to be made if necessary.**

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

H. Specification Approval Data

Council / Committee	Quality Unit-Physics Department
Reference No.	Department council No. 11
Date	16/11/2022

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission



Course Specifications

Course Title:	**Fluid Mechanics**
Course Code:	**PHY 1404**
Program:	**Bachelor of Science in Physics**
Department:	**Physics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**

Table of Contents

A. Course Identification

1. Credit hours:	**4 (3 Lectures, 0 Lab, 2 Tutorial)**
2. Course type	
a.	University ☐ College ☐ Department ☑ Others ☐
b.	Required ☑ Elective ☐
3. Level/year at which this course is offered:	**Level 10/Year 4**
4.Pre-requisites for this course (if any)**:**	**Classical Mechanics (2), PHY 1203 and Mathematical Physics (2), PHY 1334**
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**	**60**	**100%**
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	**36**
2	**Laboratory/Studio**	**0**
3	**Tutorial**	**24**
4	**Others** (specify)	**0**
	Total	**60**

B. Course Objectives and Learning Outcomes

1. Course Description

This course covers the basic concepts and principles of modern fluid mechanics. It examines the fundamental aspects of fluid motion including important fluid properties, regimes of flow, pressure variations in fluids at rest and in motion, methods of flow description and analysis. The course consists of examples and text involving everyday situations to reinforce the concept that fluid mechanics is an important part of our world as well as enabling students to master problem solving skills.

2. Course Main Objective

- **Understand the fundamental a fluid mechanics fundamentals, including concepts of mass and momentum conservation.**
- **Apply the Bernoulli equation to solve problems in fluid mechanics.**
- **Apply control volume analysis to problems in fluid mechanics.**
- **Use potential flow theory to solve problems in fluid mechanics.**
- **Gain a knowledge of laminar and turbulent boundary layer fundamentals.**

3. Course Learning Outcomes

CLOs After successful completion of the course, students will able to:		Aligned PLOs
1	**Knowledge and Understanding**	
1.1	**Outline the basic concepts and principles of fluid mechanics.**	**K1, K2**
1.2	**Define and interpret fluid statics, kinematics and dynamics.**	**K1, K2**
1.3	**Apply the concepts of the continuity, energy and momentum equations and flow measurements in fluid flows.**	**K1, K2**
1.4	**Demonstrate basic knowledge of fluid mechanics of water waves and particle displacement.**	**K1, K2**
2	**Skills:**	
2.1	**Explain and summarize the basic knowledge gained from studying fluid mechanics.**	**S1, S2**
2.2	**Develop the students ability to solve and analyze problems in physics related the topics covered by the course.**	**S2, S3**
2.3	**Communicate in a clear and concise manner orally, and using IT for acquiring and analyzing information.**	**S4, S5**
3	**Values:**	
3.1	**Show the collaboration and inter-professionalism in class discussions or team works, as well as solve problems independently.**	**V1, V2, V3**

C. Course Content

No	List of Topics	Contact Hours
1	**Fluid Mechanics Basics:** Flow, Pressure, Properties of fluids, Viscosity.	**8**
2	**Statics:** Hydostatic pressure, Manometer –pressure measurement. Hydrostatic forces on submerged surfaces.	**10**
3	**Kinematics:** Particle paths and streamlines, material derivatives, continuity equation, incompressibility and stream-function, analysis of motion relative to a point (in -2D), irrotational flow, velocity potential, complex potential.	**14**
4	**Momentum and energy in inviscid flow:** Body forces and stresses Euler's momentum equation, hydrostatics, Brenoulli's theorem and its applications, Kelvin's circulation theorem.	**12**
5	**Potential flow:** Uniform stream, line-source, dipole, line-vortex, modeling of flow round cylinders.	**8**
6	**Linear water waves:** Particle paths, phase and group velocity.	**8**
Total		**60**

D. Teaching and Assessment

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

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	**Outline the basic concepts and principles of fluid mechanics.**	• Lectures. • Tutorials. • Class discussions.	▪ Exams. ▪ Participation. ▪ Discussions.
1.2	**Define and interpret fluid statics, kinematics and dynamics.**	• Lectures. • Tutorials. • Class discussions.	▪ Exams. ▪ Homework. ▪ Quizzes.
1.3	**Apply the concepts of the continuity, energy and momentum equations and flow measurements in fluid flows.**	• Lectures. • Class discussions. • Tutorials.	▪ Participation. ▪ Exams. ▪ Discussions. ▪ Homework.
1.4	**Demonstrate basic knowledge of fluid mechanics of water waves and particle displacement.**	• Lectures. • Class discussions. • Tutorials.	▪ Participation. ▪ Exams. ▪ Discussions. ▪ Homework.
2.0	**Skills**		
2.1	**Explain and summarize the basic knowledge gained from studying fluid mechanics.**	• Lectures. • Class discussions. • Tutorials.	▪ Exams. ▪ Discussions. ▪ Participation.
2.2	**Develop the students ability to solve and analyze problems in physics related the topics covered by the course.**	• Problem classes and group tutorial. • Homework assignments as well as problems solutions.	▪ Exams. ▪ Discussions. ▪ Homework.
2.3	**Communicate in a clear and concise manner orally, on paper and using IT for acquiring and analyzing information.**	• Lectures. • Class discussions. • Tutorials. • Encourage students to use electronic mail and internal network for submitting homework and assignments. • Use digital library.	▪ Exams. ▪ Participation and activities of students in the course community and blackboard. ▪ Homework.
3.0	**Values**		
3.1	**Show the collaboration and inter-professionalism in class discussions or team works, as well as solve problems independently.**	• Small team tasks • Open discussion at classroom. • Office hours.	▪ Participation ▪ Homework's ▪ Mini-project(s).

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Class Activities (class quizzes, homework, solving problems, etc.....)	weekly	10 %
2	Midterm Exam 1	5th week	25 %
3	Midterm Exam 2	9th week	25 %
4	Final Exam	13th week	40 %

***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 :

- **Students will be assigned an academic advisor to give them the appropriate academic counseling and support.**
- **The lecturer will allocate 6 office hours per week. The assigned times will be advertised on the office door and reserved by the instructor as part of his teaching schedule.**
- **Students are able to get individual consultation appointment with teaching staff via email, phone calls and department website.**

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	Young D.F., Munson B.R., Okiishi T.H. and Huebsch W.W., ***Introduction to Fluid Mechanics,*** SI Version, 5th Edition, Wiley (2011).
Essential References Materials	- ***Robert W.F., Alan T.M, and Pritchard P.J., Introduction*** to fluid mechanics, 6th Edition, Wiley (2004). - Prieve D.C., ***A Course in Fluid Mechanics with Vector Field Theory,*** Web Draf (2000). - Chorin A. and Marsden J.E., ***A Mathematical Introduction to Fluid Mechanics,*** 4th Edition, Springer-Verlag Publishing Company (2000).
Electronic Materials	**https://units.imamu.edu.sa/colleges/en/science/Pages/default.aspx**
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	• **Each of the class room should be equipped with a whiteboard and a projector.**
Technology Resources (AV, data show, Smart Board, software, etc.)	• **Classrooms are equipped with data show and Smart Board.**

Item	Resources
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment, Quality of learning resources	• **Students** • **Second assessor**	**During the semester and at the end of the course each student will complete two evaluation forms.**
Extent of achievement of course learning outcomes, Quality of learning resources	• **Instructor** • **Second assessor**	**At the end of each semester the course instructor should complete the course report, including a summary of student questionnaire responses appraising progress and identifying changes that need to be made if necessary.**

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

H. Specification Approval Data

Council / Committee	**Quality Unit-Physics Department**
Reference No.	**Department council No. 11**
Date	**16/11/2022**

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد NCAAA T4 2020

Course Specifications

Course Title:	**Solid State Physics**
Course Code:	**PHY 1461**
Program:	**Bachelor of Science in Physics**
Department:	**Physics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**

Table of Contents

A. Course Identification

1. Credit hours:	**5 (4 Lectures, 0 Lab, 2 Tutorial)**
2. Course type	
a.	University ☐ College ☐ Department ☑ Others ☐
b.	Required ☑ Elective ☐
3. Level/year at which this course is offered:	**Level 10/Year 4**
4.Pre-requisites for this course (if any)**:**	**Quantum Mechanics (2), PHY 1313**
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**	**72**	**100%**
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	**48**
2	**Laboratory/Studio**	**0**
3	**Tutorial**	**24**
4	**Others** (specify)	**0**
	Total	**72**

B. Course Objectives and Learning Outcomes

1. Course Description

This course integrates theory of Solid State Physics with experimental demonstrations in the Research Physics Lab. The course will provide a valuable theoretical introduction and an overview of the fundamental applications of the physics of solids. This course includes theoretical description of crystal and electronic structure, lattice dynamics, and optical properties of different materials (metals, semiconductors, dielectrics, magnetic materials and superconductors, diamagnetism and paramagnetic, ferromagnetism and antiferromagnetic.), based on the classical and quantum physics principles.

2. Course Main Objective

- **Understand basic physical concepts and mathematical tools used to describe solids.**
- **Develop knowledge and understanding the fundamental applications of the physics of solid.**
- **Describe the theoretical description of crystal and electronic structure, lattice dynamics, and optical properties of different materials.**
- **Learn the techniques to solve, through discussion and reading, a wide range of specific theoretical problems including their backgrounds and implications.**

3. Course Learning Outcomes

CLOs After successful completion of the course, students will able to:		Aligned PLOs
1	**Knowledge and Understanding**	
1.1	**State the fundamental applications of the physics of solids.**	**K1, K2**
1.2	**Describe and state the lattice dynamics, phonons and thermal properties.**	**K1, K2**
1.3	**Outline the structure and physical properties (mechanical, electrical, optical & thermal) of materials.**	**K1, K2**
2	**Skills:**	
2.1	**Explain and summarize the basic knowledge gained from studying mathematical physics course.**	**S1, S2**
2.2	**Develop the students ability to solve and analyze problems in physics related the topics covered by the course.**	**S2, S3**
2.3	**Communicate in a clear and concise manner orally, and using IT for acquiring and analyzing information.**	**S4, S5**
3	**Values:**	
3.1	**Show the collaboration and inter-professionalism in class discussions or team works, as well as solve problems independently.**	**V1, V2, V3**

C. Course Content

No	List of Topics	Contact Hours
1	**Crystal Structure:** Periodic array of atoms; fundamental types of lattices; index systems for crystal planes, simple crystal structures; direct imaging of atomic structure; non-ideal crystal structures.	**12**
2	**Wave Diffraction and the Reciprocal Lattices:** Diffraction of waves by crystals; scattered wave amplitude; Brillouin zones; Fourier analysis of the basis.	**8**
3	**Binding in Crystals:** Basic types of binding, examples.	**6**
4	**Phonons-Crystal Vibrations:** Vibrations of crystals with monoatomic basis; two atoms per primitive basis; quantization of elastic waves; phonon momentum; inelastic scattering by phonons.	**10**
5	**Phonons-Thermal Properties:** Phonon, heat capacity; an harmonic crystal interactions; thermal conductivity.	**10**
6	**Free electron Fermi gas:** Energy level in One dimension, effect of	**10**

	temperature on the Fermi-Dirac distribution, Free electron gas in three dimensions, Heat capacity of the electron gas, electrical conductivity and Ohm's law.	
7	**Semiconductor crystals:** Band Gap, equations of Motion, intrinsic Carrier Concentration, impurity Conductivity and Thermoelectric Effects.	**8**
8	**Introduction to superconductivity.**	**4**
9	**Introduction to magnetism:** Diamagnetism, Paramagnetic, Ferromagnetism and Antiferromagnetic.	**4**
Total		**72**

D. Teaching and Assessment

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

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	**State the fundamental applications of the physics of solids.**	• Lectures. • Tutorials. • Class discussions.	▪ Exams. ▪ Participation. ▪ Discussions.
1.2	**Describe and state the lattice dynamics, phonons and thermal properties.**	• Lectures. • Tutorials. • Class discussions.	▪ Exams. ▪ Homework. ▪ Quizzes.
1.3	**Outline the structure and physical properties (mechanical, electrical, optical & thermal) of materials.**	• Lectures. • Class discussions. • Tutorials.	▪ Participation. ▪ Exams. ▪ Discussions. ▪ Homework.
2.0	**Skills**		
2.1	**Explain and summarize the basic knowledge gained from studying mathematical physics course.**	• Lectures. • Class discussions. • Tutorials.	▪ Exams. ▪ Discussions. ▪ Participation.
2.2	**Develop the students ability to solve and analyze problems in physics related the topics covered by the course.**	• Problem classes and group tutorial. • Homework assignments as well as problems solutions.	▪ Exams. ▪ Discussions. ▪ Homework.
2.3	**Communicate in a clear and concise manner orally, on paper and using IT for acquiring and analyzing information.**	• Lectures. • Class discussions. • Tutorials. • Encourage students to use electronic mail and internal network for submitting homework and assignments. • Use digital library.	▪ Exams. ▪ Participation and activities of students in the course community and blackboard. ▪ Homework.
3.0	**Values**		
3.1	**Show the collaboration and inter-professionalism in class discussions or team works, as well as solve problems**	• Small team tasks • Open discussion at classroom. • Office hours.	▪ Participation ▪ Homework. ▪ Mini-project(s).

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
	independently.		

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	**Class Activities (class quizzes, homework, solving problems, etc.....)**	**weekly**	**10 %**
2	**Midterm Exam 1**	**5th week**	**25 %**
3	**Midterm Exam 2**	**9th week**	**25 %**
4	**Final Exam**	**13th week**	**40 %**

***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 :

- **Students will be assigned an academic advisor to give them the appropriate academic counseling and support.**
- **The lecturer will allocate 6 office hours per week. The assigned times will be advertised on the office door and reserved by the instructor as part of his teaching schedule.**
- **Students are able to get individual consultation appointment with teaching staff via email, phone calls and department website.**

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	Kittel C., ***Introduction to Solid State Physics***, 8th Edition, John Wiley & Sons, NY (2004).
Essential References Materials	Ashcroft N.W. and Mermin N. D., ***Solid State Physics,*** Rinehart and Winston, NY (1976).
Electronic Materials	**www.imamm.org**
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	• **Each of the class room should be equipped with a whiteboard and a projector.**
Technology Resources (AV, data show, Smart Board, software, etc.)	• **Classrooms are equipped with data show and Smart Board.**
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	

G. Course Quality Evaluation

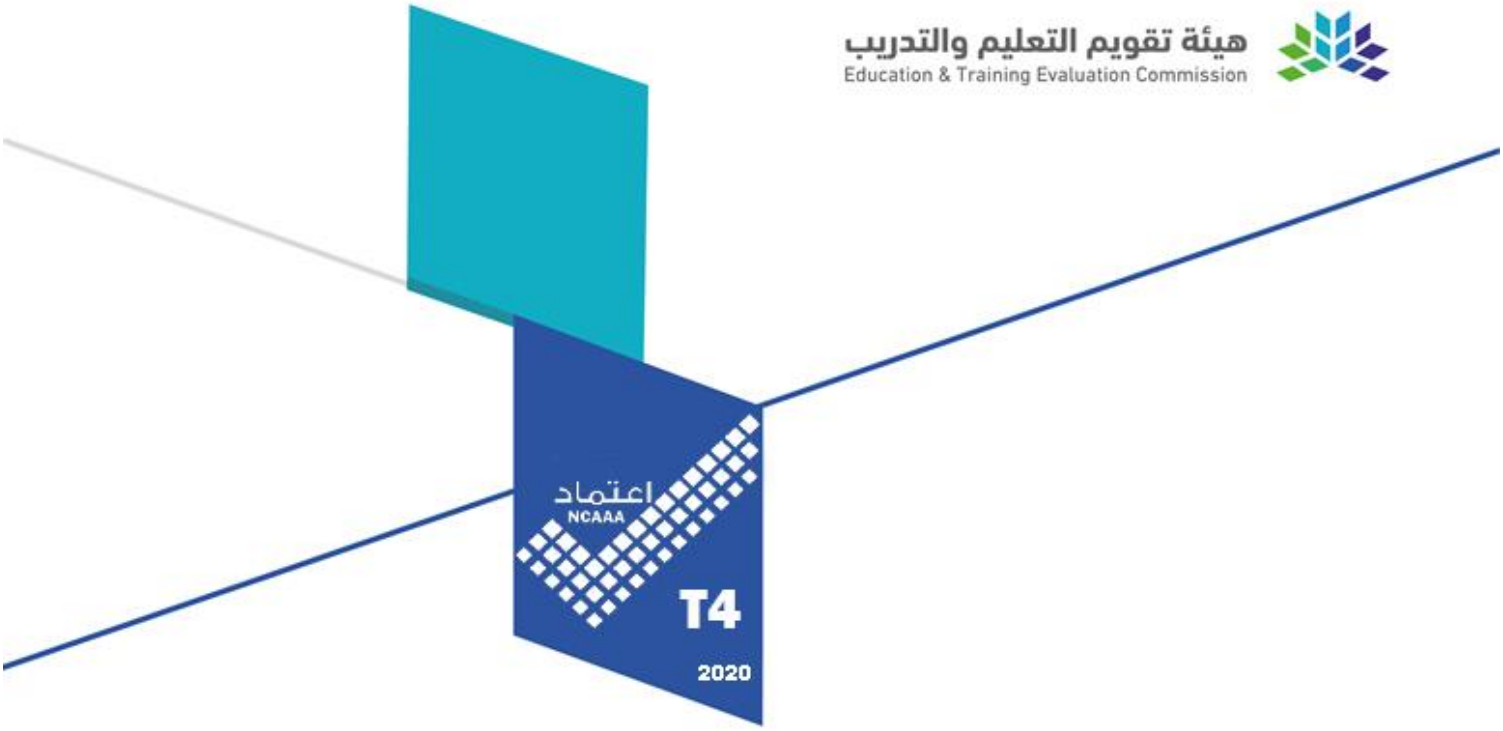
Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment, Quality of learning resources	• Students • Second assessor	During the semester and at the end of the course each student will complete two evaluation forms.
Extent of achievement of course learning outcomes, Quality of learning resources	• Instructor • Second assessor	At the end of each semester the course instructor should complete the course report, including a summary of student questionnaire responses appraising progress and identifying changes that need to be made if necessary.

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

H. Specification Approval Data

Council / Committee	Quality Unit-Physics Department
Reference No.	Department council No. 11
Date	16/11/2022

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission



Course Specifications

Course Title:	**Nuclear Physics**
Course Code:	**PHY 1464**
Program:	**Bachelor of Science in Physics**
Department:	**Physics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**

Table of Contents

A. Course Identification

1. Credit hours:	**4 (3 Lectures, 0 Lab, 2 Tutorial)**
2. Course type	
a.	University ☐ College ☐ Department ☑ Others ☐
b.	Required ☑ Elective ☐
3. Level/year at which this course is offered:	**Level 10/Year 4**
4.Pre-requisites for this course (if any)**:**	**Quantum mechanics (1), PHY 1312**
5. Co-requisites for this course (if any)**:**	

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	**60**	**100%**
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	**36**
2	**Laboratory/Studio**	**0**
3	**Tutorial**	**24**
4	**Others** (specify)	**0**
	Total	**60**

B. Course Objectives and Learning Outcomes

1. Course Description

This course introduces basic nuclear physics, including nuclear decays and reactions and nuclear structure, while covering the essential areas of basic research and practical applications. It provides fundamental principles that underline nuclear science and its applications, as well as mathematical tools needed to grasp these concepts. Applications to nuclear science will be used to illustrate these principles. Discussions of theory are reinforced with examples which illustrate and apply the theoretical formulism, thus aiding students in their reading and analysis of current literature.

2. Course Main Objective

- **Learn and understand the basic properties of the nucleus.**
- **Understand the role of conservation laws in decay processes and reactions.**
- **Learn the principles of nuclear physics related to fission and fusion.**
- **Compare and construct different reaction mechanisms in relation to cross-sections, excitation functions, and angular distributions.**
- **Summarize and account for the main aspects of some applications of nuclear physics.**

3. Course Learning Outcomes

	CLOs After successful completion of the course, students will able to:	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	**Define and recall the basic nuclear concepts and nuclear properties.**	**K1, K2**
1.2	**Describe the force between nucleons.**	**K1, K2**
1.3	**Outline the main nuclear models.**	**K1, K2**
1.4	**Demonstrate basic knowledge of radioactive decay.**	**K1, K2**
2	**Skills:**	
2.1	**Explain and summarize the basic knowledge gained from studying nuclear physics.**	**S1, S2**
2.2	**Develop the students ability to solve and analyze problems in physics related the topics covered by the course.**	**S2, S3**
2.3	**Communicate in a clear and concise manner orally, and using IT for acquiring and analyzing information.**	**S4, S5**
3	**Values:**	
3.1	**Show the collaboration and inter-professionalism in class discussions or team works, as well as solve problems independently.**	**V1, V2, V3**

C. Course Content

No	List of Topics	Contact Hours
1	**Basic Nuclear Concepts and Nuclear Properties:** History and overview, Some introductory terminology, Nuclear properties, Units and dimensions, The nuclear radius, Mass and abundance of nuclides, Nuclear binding energy, Nuclear angular momentum and parity, Nuclear electromagnetic moments.	**14**
2	**The force between nucleons:** The deuteron, Proton-proton and neutron-neutron interactions, Properties of the nuclear force.	**12**
3	**Nuclear Models:** The shell model, Even-Z, Even-N nuclei and collective structure.	**10**
4	**Radioactive Decay:** The radioactive decay law, Production and decay of radioactivity, Growth of daughter activities, Types of decay, Natural radioactivity, Units for measuring radiation.	**12**
5	**Nuclear Reactions:** Types of reactions and conservation laws, Energetics of nuclear reactions, Isospin, Reaction cross section, Experimental techniques, Coulomb scattering, Nuclear scattering, Direct reactions. Fusion and Fission.	**12**
	Total	**60**

D. Teaching and Assessment

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

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	**Define and recall the basic nuclear concepts and nuclear properties.**	• Lectures. • Tutorials. • Class discussions.	▪ Exams. ▪ Participation. ▪ Discussions.
1.2	**Describe the force between nucleons.**	• Lectures. • Tutorials. • Class discussions.	▪ Exams. ▪ Homework. ▪ Quizzes.
1.3	**Outline the main nuclear models.**	• Lectures. • Class discussions. • Tutorials.	▪ Participation. ▪ Exams. ▪ Discussions. ▪ Homework.
1.4	**Demonstrate basic knowledge of radioactive decay.**	• Lectures. • Class discussions. • Tutorials.	▪ Participation. ▪ Exams. ▪ Discussions. ▪ Homework.
2.0	**Skills**		
2.1	**Explain and summarize the basic knowledge gained from studying nuclear physics.**	• Lectures. • Class discussions. • Tutorials.	▪ Exams. ▪ Discussions. ▪ Participation.
2.2	**Develop the students ability to solve and analyze problems in physics related the topics covered by the course.**	• Problem classes and group tutorial. • Homework assignments as well as problems solutions.	▪ Exams. ▪ Discussions. ▪ Homework.
2.3	**Communicate in a clear and concise manner orally, and using IT for acquiring and analyzing information.**	• Lectures. • Class discussions. • Tutorials. • Encourage students to use electronic mail and internal network for submitting homework and assignments. • Use digital library.	▪ Exams. ▪ Participation and activities of students in the course community and blackboard. ▪ Homework.
3.0	**Values**		
3.1	**Show the collaboration and inter-professionalism in class discussions or team works, as well as solve problems independently.**	• Small team tasks • Open discussion at classroom. • Office hours.	▪ Participation ▪ Homework's ▪ Mini-project(s).

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	**Class Activities (class quizzes, homework, solving problems, etc.....)**	**weekly**	**10 %**

#	Assessment task*	Week Due	Percentage of Total Assessment Score
2	Midterm Exam 1	5th week	25 %
3	Midterm Exam 2	9th week	25 %
4	Final Exam	13th week	40 %

***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 :

- **Students will be assigned an academic advisor to give them the appropriate academic counseling and support.**
- **The lecturer will allocate 6 office hours per week. The assigned times will be advertised on the office door and reserved by the instructor as part of his teaching schedule.**
- **Students are able to get individual consultation appointment with teaching staff via email, phone calls and department website.**

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	Krane K.S., ***Introductory Nuclear Physics,*** Wiley (1988).
Essential References Materials	- Burcham W.E. and Jobes M., ***Nuclear and Particle Physics,*** 2nd Edition, John Wiley & Sons Inc (1995). - Knoll G.F., ***Radiation Detection and Measurements,*** 2nd Edition, Wiley (2010). - M Guran A. C and Zimmerman W.B., ***The Quantum World of Nuclear Physics,*** World Scientific (2005).
Electronic Materials	**https://units.imamu.edu.sa/colleges/en/science/Pages/default.aspx**
Other Learning Materials	**Multimedia associated with the text book and the relevant websites.**

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	• **Each of the class room should be equipped with a whiteboard and a projector.**
Technology Resources (AV, data show, Smart Board, software, etc.)	• **Classrooms are equipped with data show and Smart Board.**
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment, Quality of learning resources.	• Students • Second assessor	During the semester and at the end of the course each student will complete two evaluation forms.
Extent of achievement of course learning outcomes, Quality of learning resources.	• Instructor • Second assessor	At the end of each semester the course instructor should complete the course report, including a summary of student questionnaire responses appraising progress and identifying changes that need to be made if necessary.

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

H. Specification Approval Data

Council / Committee	Quality Unit-Physics Department
Reference No.	Department council No. 11
Date	16/11/2022

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد NCAAA T4 2020

Course Specifications

Course Title:	**Computational Physics**
Course Code:	**PHY 1436**
Program:	**Bachelor of Science in Physics**
Department:	**Physics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**

Table of Contents

A. Course Identification

1. Credit hours:	**4 (2 Lectures, 2 Lab, 2 Tutorial)**
2. Course type	
a.	University ☐ College ☐ Department ☑ Others ☐
b.	Required ☑ Elective ☐
3. Level/year at which this course is offered:	**Level 11/Year 4**
4.Pre-requisites for this course (if any)**:**	**Mathematical Physics (2), PHY 1334 and Computer Programming for Science, CS 1249**
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	72	100%
2	Blended		
3	E-learning		
4	Distance learning		
5	Other		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	24
2	Laboratory/Studio	24
3	Tutorial	24
4	Others (specify)	0
	Total	72

B. Course Objectives and Learning Outcomes

1. Course Description

Computers and computation are extremely important components of physics and should be integral parts of a physicist's education. Furthermore, computational physics is reshaping the way calculations are made in all areas of physics. This course covers the different types of computational problems using a programming language with exercises developed around problems of physical interest.

2. Course Main Objective

- **Learn and understand the basic knowledge of computational methods used in physics.**
- **Formulate a physical problem in a manner suitable for computational solution.**
- **Construct a working, structured program in programming language that includes standard numerical procedures to solve a physical problem.**
- **Employ appropriate numerical method to interpolate and extrapolate data collected from physics experiments.**

3. Course Learning Outcomes

	CLOs After successful completion of the course, students will able to:	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	**Outline the computational methods in solving problems in physics.**	**K1, K2**
1.2	**Describe and state the interpolation, extrapolation and data fitting, numerical ordinary and partial differential equations, numerical integration, and matrix algebra.**	**K1, K2**
1.3	**Define numerical algorithms into MATLAB and visualize the results of the computations.**	**K1, K2**
1.4	**State the computational methods in solving problems in physics.**	**K1, K2**
2	**Skills:**	
2.1	**Explain and summarize the basic knowledge gained from studying computational physics.**	**S1, S2**
2.2	**Develop the students ability to solve and analyze problems in physics related the topics covered by the course.**	**S2, S3**
2.3	**Communicate in a clear and concise manner orally, and using IT for acquiring and analyzing information.**	**S4, S5**
3	**Values:**	
3.1	**Show the collaboration and inter-professionalism in class discussions or team works, as well as solve problems independently.**	**V1, V2, V3**

C. Course Content

No	List of Topics	Contact Hours
1	**Introduction:** Overview - A Programming Language: Computer algorithms and languages, Using different software's, Applications: Newton and Kepler laws.	**8**
2	**Finding roots of equations:** Bisection method- Newton's method- fixed point method, Algebraic and transcendental equations, Rearrangement of the equation.	**8**
3	**Interpolation:** Polynomial interpolation, linear interpolation, quadratic interpolation, Lagrange interpolation, Newton difference method.	**8**
4	**The method of least squares (Data Fitting)** Linear least squares; non-linear least squares.	**8**

5	**Numerical Integration:** One dimensional integral: Rectangle rule; Trapezium rule; Simpson's rule; Gaussian integration.	**8**
6	**Numerical solution of linear system (Matrix Algebra):** Simultaneous linear equations; Gaussian elimination; Pivoting, LU and cholesky.	**8**
7	**Iterative method:** Jacobi, Gauss–Seidel iteration; convergence and matrix norm, tridiagonal matrices.	**6**
8	**Numerical solution of Differential equations:** Difference equations; Euler and Picard methods; Taylor series solutions; System of equations, Runge– Kutta methods, Higher-order equations.	**6**
9	**Finite differences method for ordinary differential equations**	**6**
10	**Introduction to PDEs:** First order linear PDEs -Second order linear PDEs.	**6**
Total		**72**

D. Teaching and Assessment

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

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	**Outline the computational methods in solving problems in physics.**	• Lectures. • Tutorials. • Class discussions.	▪ Exams. ▪ Participation. ▪ Discussions.
1.2	**Describe and state the interpolation, extrapolation and data fitting, numerical ordinary and partial differential equations, numerical integration, and matrix algebra.**	• Lectures. • Tutorials. • Class discussions.	▪ Exams. ▪ Homework. ▪ Quizzes.
1.3	**Define numerical algorithms into MATLAB and visualize the results of the computations.**	• Lectures. • Class discussions. • Tutorials.	▪ Participation. ▪ Exams. ▪ Discussions. ▪ Homework.
1.4	**State the computational methods in solving problems in physics.**	• Lectures. • Class discussions. • Tutorials.	▪ Participation. ▪ Exams. ▪ Discussions. ▪ Homework.
2.0	**Skills**		
2.1	**Explain and summarize the basic knowledge gained from studying computational Physics.**	• Lectures. • Class discussions. • Tutorials.	▪ Exams. ▪ Discussions. ▪ Participation.
2.2	**Develop the students ability to solve and analyze problems in physics related the topics covered by the course.**	• Problem classes and group tutorial. • Homework assignments as well as problems solutions.	▪ Exams. ▪ Discussions. ▪ Homework.
2.3	**Communicate in a clear and**	• Lectures.	▪ Exams.

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
	concise manner orally, and using IT for acquiring and analyzing information.	• Class discussions. • Tutorials. • Encourage students to use electronic mail and internal network for submitting homework and assignments. • Use digital library.	▪ Participation and activities of students in the course community and blackboard. ▪ Homework.
3.0	**Values**		
3.1	**Show the collaboration and inter-professionalism in class discussions or team works, as well as solve problems independently.**	• Small team tasks • Open discussion at classroom. • Office hours.	▪ Participation ▪ Homework's ▪ Mini-project(s).

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	**Class Activities (class quizzes, homework, solving problems, etc.....)**	**weekly**	**10 %**
2	**Midterm Exam 1**	**5th week**	**25 %**
3	**Midterm Exam 2**	**9th week**	**25 %**
4	**Final Exam**	**13th week**	**40 %**

***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 :

- **Students will be assigned an academic advisor to give them the appropriate academic counseling and support.**
- **The lecturer will allocate 6 office hours per week. The assigned times will be advertised on the office door and reserved by the instructor as part of his teaching schedule.**
- **Students are able to get individual consultation appointment with teaching staff via email, phone calls and department website.**

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	Chow T., Mathematical Methods for Physicists: A Concise Introduction, Cambridge University Press (2000).
Essential References Materials	-Pang Tao, An Introduction to Computational Physics, Cambridge University Press, (2006). -Richard Fitzpatrick, Computational Physics Texas University Press (2006).
Electronic Materials	https://units.imamu.edu.sa/colleges/en/science/Pages/default.aspx
Other Learning Materials	Multimedia associated with the text book and the relevant websites.

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	• **Each of the class room should be equipped with a whiteboard and a projector.**
Technology Resources (AV, data show, Smart Board, software, etc.)	• **Classrooms are equipped with data show and Smart Board.**
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment, Quality of learning resources.	• **Students** • **Second assessor**	**During the semester and at the end of the course each student will complete two evaluation forms.**
Extent of achievement of course learning outcomes, Quality of learning resources.	• **Instructor** • **Second assessor**	**At the end of each semester the course instructor should complete the course report, including a summary of student questionnaire responses appraising progress and identifying changes that need to be made if necessary.**

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

H. Specification Approval Data

Council / Committee	Quality Unit-Physics Department
Reference No.	Department council No. 11
Date	16/11/2022

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد NCAAA T4 2020

Course Specifications

Course Title:	**Selected Topics in Applied Physics (1)**
Course Code:	**PHY 1471**
Program:	**Bachelor of Science in Physics**
Department:	**Physics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**

Table of Contents

A. Course Identification

1. Credit hours:	**3 (2 Lectures, 0 Lab, 2 Tutorial)**
2. Course type	
a.	University ☐ College ☐ Department ☑ Others ☐
b.	Required ☑ Elective ☐
3. Level/year at which this course is offered:	**Level 11/Year 4**
4.Pre-requisites for this course (if any)**:**	**Atomic Physics, PHY 1362**
5. Co-requisites for this course (if any)**:**	**1**

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	**48**	**100%**
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	**24**
2	**Laboratory/Studio**	**0**
3	**Tutorial**	**24**
4	**Others** (specify)	**0**
	Total	**48**

B. Course Objectives and Learning Outcomes

1. Course Description

The feature of this course will be determined according to local national or international economic developments, significant recent research in the field, technological changes affecting skill requirements, employment demand, government policies on higher education or on matters affecting the fields for which students are being prepared, national or international developments in professional practice in the field.

2. Course Main Objective

Selected Topics in Physics (STP) will highlight a specific topic in physics, which will be selected by the Department council. The STP course will feature rapidly developing current trends in the selected research area or, from a specific viewpoint, topics of interest in applied physics and its related inter-disciplines. A decision of the selected areas planned for future issues will be decided in the Department of Physics by the Department Council.

3. Course Learning Outcomes

CLOs After successful completion of the course, students will able to:		Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Apply of the fundamental principles to particular areas.	K1, K2
1.2	Define subjects which students' study in greater depth, learning of current developments at the frontiers of the subject.	K1, K2
1.3	Outline knowledge of the principles of operations to particular areas.	K1, K2
1.4	Outline knowledge and skills in advanced mathematics and its application in physics.	K1, K2
2	**Skills:**	
2.1	Explain and summarize the basic knowledge gained from studying this course.	S1, S2
2.2	Develop the students ability to solve and analyze problems in physics related the topics covered by the course.	S2, S3
2.3	Communicate in a clear and concise manner orally, on paper and using IT for acquiring and analyzing information.	S4, S5
3	**Values:**	
3.1	Show the collaboration and inter-professionalism in class discussions or team works, as well as solve problems independently.	V1, V2, V3

C. Course Content

No	List of Topics	Contact Hours
1		
2		
3		
4		
5		
Total		48

D. Teaching and Assessment

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

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	**Apply of the fundamental principles to particular areas.**	• Lectures. • Tutorials. • Class discussions.	▪ Exams. ▪ Participation. ▪ Discussions.
1.2	**Define subjects which students' study in greater depth, learning of current developments at the frontiers of the subject.**	• Lectures. • Tutorials. • Class discussions.	▪ Exams. ▪ Homework. ▪ Quizzes.
1.3	**Outline knowledge of the principles of operations to particular areas.**	• Lectures. • Class discussions. • Tutorials.	▪ Participation. ▪ Exams. ▪ Discussions. ▪ Homework.
1.4	**Outline knowledge and skills in advanced mathematics and its application in physics.**	• Lectures. • Class discussions. • Tutorials.	▪ Participation. ▪ Exams. ▪ Discussions. ▪ Homework.
2.0	**Skills**		
2.1	**Explain and summarize the basic knowledge gained from studying this course.**	• Lectures. • Class discussions. • Tutorials.	▪ Exams. ▪ Discussions. ▪ Participation.
2.2	**Develop the students ability to solve and analyze problems in physics related the topics covered by the course.**	• Problem classes and group tutorial. • Homework assignments as well as problems solutions.	▪ Exams. ▪ Discussions. ▪ Homework.
2.3	**Communicate in a clear and concise manner orally, on paper and using IT for acquiring and analyzing information.**	• Lectures. • Class discussions. • Tutorials. • Encourage students to use electronic mail and internal network for submitting homework and assignments. • Use digital library.	▪ Exams. ▪ Participation and activities of students in the course community and blackboard. ▪ Homework.
3.0	**Values**		
3.1	**Show the collaboration and inter-professionalism in class discussions or team works, as well as solve problems independently.**	• Small team tasks • Open discussion at classroom. • Office hours.	▪ Participation ▪ Homework's ▪ Mini-project(s).

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Class Activities (class quizzes, homework, solving problems, etc.....)	weekly	10 %
2	Midterm Exam 1	5th week	25 %
3	Midterm Exam 2	9th week	25 %
4	Final Exam	13th week	40 %

***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 :

- **Students will be assigned an academic advisor to give them the appropriate academic counseling and support.**
- **The lecturer will allocate 6 office hours per week. The assigned times will be advertised on the office door and reserved by the instructor as part of his teaching schedule.**
- **Students are able to get individual consultation appointment with teaching staff via email, phone calls and department website.**

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	
Essential References Materials	
Electronic Materials	**https://units.imamu.edu.sa/colleges/en/science/Pages/default.aspx**
Other Learning Materials	**Multimedia associated with the text book and the relevant websites.**

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	• **Each of the class room should be equipped with a whiteboard and a projector.**
Technology Resources (AV, data show, Smart Board, software, etc.)	• **Classrooms are equipped with data show and Smart Board.**
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	

G. Course Quality Evaluation

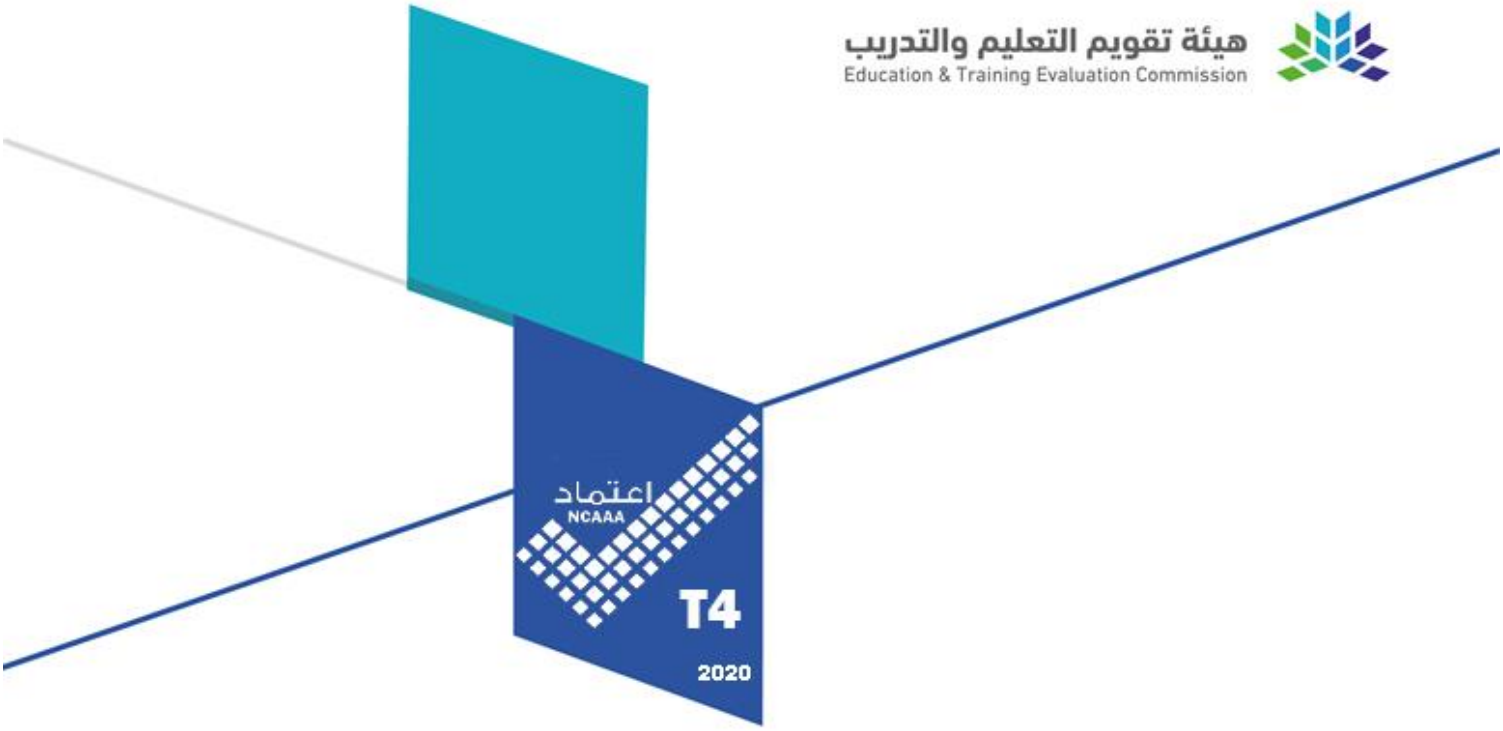
Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment, Quality of learning resources.	• Students • Second assessor	During the semester and at the end of the course each student will complete two evaluation forms.
Extent of achievement of course learning outcomes, Quality of learning resources.	• Instructor • Second assessor	At the end of each semester the course instructor should complete the course report, including a summary of student questionnaire responses appraising progress and identifying changes that need to be made if necessary.

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

H. Specification Approval Data

Council / Committee	Quality Unit-Physics Department
Reference No.	Department council No. 11
Date	16/11/2022

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission



Course Specifications

Course Title:	**Selected Topics in Applied Physics (2)**
Course Code:	**PHY 1472**
Program:	**Bachelor of Science in Physics**
Department:	**Physics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**

Table of Contents

A. Course Identification

1. Credit hours:	**3 (2 Lectures, 0 Lab, 2 Tutorial)**
2. Course type	
a.	University ☐ College ☐ Department ☑ Others ☐
b.	Required ☑ Elective ☐
3. Level/year at which this course is offered:	**Level 11/Year 4**
4.Pre-requisites for this course (if any)**:**	
5. Co-requisites for this course (if any)**:**	

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	**48**	**100%**
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	**24**
2	**Laboratory/Studio**	**0**
3	**Tutorial**	**24**
4	**Others** (specify)	**0**
	Total	**48**

B. Course Objectives and Learning Outcomes

1. Course Description

The feature of this course will be determined according to local national or international economic developments, significant recent research in the field, technological changes affecting skill requirements, employment demand, government policies on higher education or on matters affecting the fields for which students are being prepared, national or international developments in professional practice in the field.

2. Course Main Objective

Selected Topics in Physics (STP) will highlight a specific topic in physics, which will be selected by the Department council. The STP course will feature rapidly developing current trends in the selected research area or, from a specific viewpoint, topics of interest in applied physics and its related inter-disciplines. A decision of the selected areas planned for future issues will be decided in the Department of Physics by the Department Council.

3. Course Learning Outcomes

CLOs After successful completion of the course, students will able to:		Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Apply of the fundamental principles to particular areas.	K1, K2
1.2	Define subjects which students' study in greater depth, learning of current developments at the frontiers of the subject.	K1, K2
1.3	Outline knowledge of the principles of operations to particular areas.	K1, K2
1.4	Outline knowledge and skills in advanced mathematics and its application in physics.	K1, K2
2	**Skills:**	
2.1	Explain and summarize the basic knowledge gained from studying this course.	S1, S2
2.2	Develop the students ability to solve and analyze problems in physics related the topics covered by the course.	S2, S3
2.3	Communicate in a clear and concise manner orally, on paper and using IT for acquiring and analyzing information.	S4, S5
3	**Values:**	
3.1	Show the collaboration and inter-professionalism in class discussions or team works, as well as solve problems independently.	V1, V2, V3

C. Course Content

No	List of Topics	Contact Hours
1		
2		
3		
4		
5		
Total		48

D. Teaching and Assessment

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

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	**Apply of the fundamental principles to particular areas.**	• Lectures. • Tutorials. • Class discussions.	▪ Exams. ▪ Participation. ▪ Discussions.
1.2	**Define subjects which students' study in greater depth, learning of current developments at the frontiers of the subject.**	• Lectures. • Tutorials. • Class discussions.	▪ Exams. ▪ Homework. ▪ Quizzes.
1.3	**Outline knowledge of the principles of operations to particular areas.**	• Lectures. • Class discussions. • Tutorials.	▪ Participation. ▪ Exams. ▪ Discussions. ▪ Homework.
1.4	**Outline knowledge and skills in advanced mathematics and its application in physics.**	• Lectures. • Class discussions. • Tutorials.	▪ Participation. ▪ Exams. ▪ Discussions. ▪ Homework.
2.0	**Skills**		
2.1	**Explain and summarize the basic knowledge gained from studying this course.**	• Lectures. • Class discussions. • Tutorials.	▪ Exams. ▪ Discussions. ▪ Participation.
2.2	**Develop the students ability to solve and analyze problems in physics related the topics covered by the course.**	• Problem classes and group tutorial. • Homework assignments as well as problems solutions.	▪ Exams. ▪ Discussions. ▪ Homework.
2.3	**Communicate in a clear and concise manner orally, on paper and using IT for acquiring and analyzing information.**	• Lectures. • Class discussions. • Tutorials. • Encourage students to use electronic mail and internal network for submitting homework and assignments. • Use digital library.	▪ Exams. ▪ Participation and activities of students in the course community and blackboard. ▪ Homework.
3.0	**Values**		
3.1	**Show the collaboration and inter-professionalism in class discussions or team works, as well as solve problems independently.**	• Small team tasks • Open discussion at classroom. • Office hours.	▪ Participation ▪ Homework's ▪ Mini-project(s).

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Class Activities (class quizzes, homework, solving problems, etc.....)	weekly	10 %
2	Midterm Exam 1	5th week	25 %
3	Midterm Exam 2	9th week	25 %
4	Final Exam	13th week	40 %

***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 :

- **Students will be assigned an academic advisor to give them the appropriate academic counseling and support.**
- **The lecturer will allocate 6 office hours per week. The assigned times will be advertised on the office door and reserved by the instructor as part of his teaching schedule.**
- **Students are able to get individual consultation appointment with teaching staff via email, phone calls and department website.**

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	
Essential References Materials	
Electronic Materials	**https://units.imamu.edu.sa/colleges/en/science/Pages/default.aspx**
Other Learning Materials	**Multimedia associated with the text book and the relevant websites.**

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	• **Each of the class room should be equipped with a whiteboard and a projector.**
Technology Resources (AV, data show, Smart Board, software, etc.)	• **Classrooms are equipped with data show and Smart Board.**
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	

G. Course Quality Evaluation

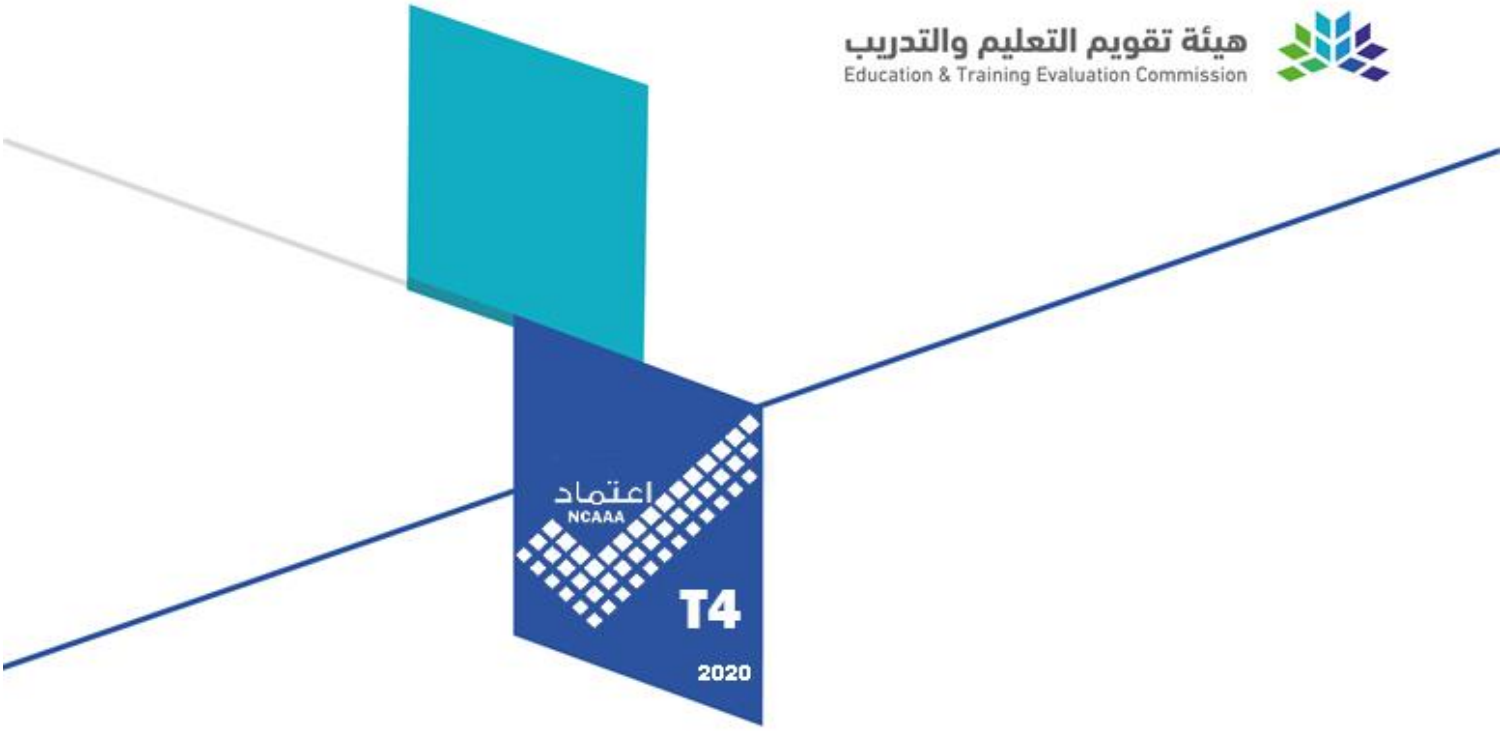
Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment, Quality of learning resources.	• Students • Second assessor	During the semester and at the end of the course each student will complete two evaluation forms.
Extent of achievement of course learning outcomes, Quality of learning resources.	• Instructor • Second assessor	At the end of each semester the course instructor should complete the course report, including a summary of student questionnaire responses appraising progress and identifying changes that need to be made if necessary.

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

H. Specification Approval Data

Council / Committee	Quality Unit-Physics Department
Reference No.	Department council No. 11
Date	16/11/2022

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission



Course Specifications

Course Title:	**Solid State Physics & Modern Physics Laboratory**
Course Code:	**PHY 1481**
Program:	**Bachelor of Science in Physics**
Department:	**Physics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**

Table of Contents

A. Course Identification

1. Credit hours:	**2 (0 Lectures, 2 Lab, 2 Tutorial)**
2. Course type	
a.	University ☐ College ☐ Department ☑ Others ☐
b.	Required ☑ Elective ☐
3. Level/year at which this course is offered:	**Level 11/Year 4**
4.Pre-requisites for this course (if any)**:**	**Solid State Physics, PHY 1461**
5. Co-requisites for this course (if any)**:**	

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	**48**	**100%**
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	**0**
2	**Laboratory/Studio**	**24**
3	**Tutorial**	**24**
4	**Others** (specify)	**0**
	Total	**48**

B. Course Objectives and Learning Outcomes

1. Course Description

This course provides laboratory work at the advanced undergraduate level. The course emphasizes experimental techniques, procedures and formal report writing. Laboratory experiments reinforce or extend the work of the lecture portion of the course. The course includes experimental description of crystal and electronic structure, lattice dynamics, and optical properties of different materials.

2. Course Main Objective

- **Observe and analyze physical data relevant to some of the experiments in solid state physics and Modern Physics.**
- **Provide students with a thorough understanding of the basic concepts of physics and the methods scientists use to explore natural phenomena, including observation, hypothesis development, measurement and data collection, experimentation, evaluation of evidence, and employment of mathematical analysis.**
- **Develop the student's mathematical ability to manipulate formulae and derive correct numerical solutions that can be measured in the real world.**
- **Instruct students in the competent use of laboratory equipment to collect and record data, apply relevant mathematical models and perform required computations, and present the derived results as an application of a measured observation of the physical world.**

3. Course Learning Outcomes

CLOs After successful completion of the course, students will able to:		Aligned PLOs
1	**Knowledge and Understanding**	
1.1	**Recognize the scientific method of inquiry to draw conclusions based on verifiable evidence of crystallography.**	**K1; K2**
1.2	**Define the theoretical bases of transport phenomena of charged carrier experiments.**	**K1; K2**
1.3	**Describe the theoretical bases of photoconduction process in semiconductors experiments.**	**K1; K2**
2	**Skills:**	
2.1	**Analyze experiments according to the plan besides the learning from lab lecture.**	**S1; S2**
2.2	**Explain and use information from the output of experiment to draw conclusions.**	**S2; S3**
2.3	**Summarize conclusions and write reports.**	**S3; S4**
2.4	**Communicate in a clear and concise manner orally, on paper and using IT for acquiring and analyzing information.**	**S4; S5**
3	**Values:**	
3.1	**Show the collaboration and inter-professionalism in class discussions or team works, as well as solve problems independently.**	**V1; V2; V3**

C. Course Content

No	List of Topics	Contact Hours
1	**Introduction.**	**4**
2	**Experiment 1:** Diffraction of electron in a polycrystalline lattice (Debye-Scherrer diffraction).	**5**
3	**Experiment 2:** Plank's constant (h)	**5**
4	**Experiment 3:** Bragg reflection: diffraction of x-rays at a monocrystal.	**5**
5	**Experiment 4:** Investigating the Hall effect in silver.	**5**
6	**Revision.**	**5**
7	**Experiment 5:** Recording the current-voltage characteristics of a CdS	**5**

	photoresistor.	
8	**Experiment 6:** Determination of the Specific Charge of the Electron.	**5**
9	**Experiment 7:** Electron spin resonance (ESR).	**5**
10	**Revision.**	**4**
Total		**48**

D. Teaching and Assessment

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

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	**Recognize the scientific method of inquiry to draw conclusions based on verifiable evidence of crystallography.**	• Supervision by lab instructor • Submitting an individual lab report. • Performing lab. experiments at the scheduled times.	▪ Participation. ▪ Report evaluation. ▪ Lab experiment check. ▪ Exams.
1.2	**Define the theoretical bases of transport phenomena of charged carrier experiments.**	• Supervision by lab instructor • Submitting an individual lab report. • Performing lab. experiments at the scheduled times.	▪ Discussion. ▪ Report evaluation. ▪ Lab experiment check. ▪ Exams.
1.3	**Describe the theoretical bases of photoconduction process in semiconductors experiments.**	• Supervision by lab instructor • Submitting an individual lab report. • Performing lab. experiments at the scheduled times.	▪ Participation. ▪ Report evaluation. ▪ Lab experiment check. ▪ Exams.
2.0	**Skills**		
2.1	**Analyze experiments according to the plan besides the learning from lab lecture.**	• Using the multimedia and visual materials, Lab manual and the theoretical bases of the course. • Interaction between students in the lab course community and discussions in the lab.	▪ Analyze experiments according to the plan besides the learning from lab lecture.
2.2	**Explain and use information from the output of experiment to draw conclusions.**	• Experiments setting up, data recording and calculations based on lab manual and lectures (co-requisites).	▪ Explain and use information from the output of experiment to draw conclusions.
2.3	**Summarize conclusions and write reports.**	• Experiments setting up, data recording and calculations based on lab manual and lectures (co-	▪ Summarize conclusions and write reports.

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
		requisites).	
2.4	**Communicate in a clear and concise manner orally, on paper and using IT for acquiring and analyzing information.**	• Lectures. • Class discussions. • Encourage students to use electronic mail and internal network for submitting homework and assignments. • Use digital library.	▪ Communicate in a clear and concise manner orally, on paper and using IT for acquiring and analyzing information.
3.0	**Values**		
3.1	**Show the collaboration and inter-professionalism in class discussions or team works, as well as solve problems independently.**	• Small team tasks • Open discussion at classroom. • Office hours.	▪ Reports. ▪ Presentations. ▪ Participation.

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	**Lab Activities (Lab quizzes, reports, homework, solving problems, etc.....)**	**weekly**	**35 %**
2	**Midterm Exam 1**	**5th week**	**7.5 %**
3	**Midterm Exam 2**	**9th week**	**7.5 %**
4	**Final Exam**	**13th week**	**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:

- **Students will be assigned an academic advisor to give them the appropriate academic counseling and support.**
- **The lecturer will allocate 6 office hours per week. The assigned times will be advertised on the office door and reserved by the instructor as part of his teaching schedule.**
- **Students are able to get individual consultation appointment with teaching staff via email, phone calls and department website.**

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	
Essential References Materials	
Electronic Materials	**https://units.imamu.edu.sa/colleges/en/science/Pages/default.aspx**
Other Learning Materials	• **Laboratory Manual supplied by the Department of Physics.** • **Laboratory Manual is available at the website of the Department of Physics.** • **Multimedia associated with The Labe manual and the relevant websites**

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	• **Each of the class room should be equipped with a whiteboard and a projector.** • **Each class room should be equipped with max 25 seat.**
Technology Resources (AV, data show, Smart Board, software, etc.)	• **Classrooms are equipped with data show and Smart Board, and internet connection.**
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	**See attached file**

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment, Quality of learning resources.	• **Students** • **Second assessor**	**During the semester and at the end of the course each student will complete two evaluation forms.**
Extent of achievement of course learning outcomes, Quality of learning resources.	• **Instructor** • **Second assessor**	**At the end of each semester the course instructor should complete the course report, including a summary of student questionnaire responses appraising progress and identifying changes that need to be made if necessary.**

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

Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	Quality Unit-Physics Department
Reference No.	Department council No. 11
Date	16/11/2022

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد
NCAAA
T5
2019

Field Experience Specifications

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد NCAAA T4 2020

Course Specifications

Course Title:	**Research Project**
Course Code:	**PHY 1498**
Program:	**Bachelor of Science in Physics**
Department:	**Physics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**

Table of Contents

A. Course Identification

1. Credit hours:	**4 (2 Lectures, 2 Lab, 2 Tutorial)**
2. Course type	
a.	University ☐ College ☐ Department ☑ Others ☐
b.	Required ☑ Elective ☐
3. Level/year at which this course is offered:	**Level 12/Year 4**
4.Pre-requisites for this course (if any)**:**	**Solid State Physics, PHY 1461**
5. Co-requisites for this course (if any)**:**	

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	**60**	**100%**
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	**60**
2	**Laboratory/Studio**	
3	**Tutorial**	
4	**Others** (specify)	
	Total	**60**

B. Course Objectives and Learning Outcomes

1. Course Description

To demonstrate a student's work ethic, level of initiative, determination and approach to problem solving, give an early indication of a physicist's project management skills, as each student is largely responsible for their own programme of work, test of general physics ability and plan and carry out a detailed and original piece of scientific research and communicate the results.

2. Course Main Objective

Organization of research including: logistics, recording, archiving, numerical analysis and presentation of data, interpretation and presentation of results in the form of a dissertation, develop important skills in summarizing a research area.

3. Course Learning Outcomes

	CLOs After successful completion of the course, students will able to:	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Outline and learn to handle a scientific project.	K1, K2
1.2	Describe and state good project management skills.	K1, K2
1.3	Define and carry out a detailed and original piece of scientific research and communicate the results.	K1, K2
2	**Skills:**	
2.1	Develop the students' ability to distinguish between different physical phenomena related to project.	S1, S2
2.2	Show ability to deal with various sources of knowledge and the ability to exploit and to estimate the time.	S2, S3
2.3	Communicate in a clear and concise manner orally, and using IT for acquiring and analyzing information.	S4, S5
2.4	Illustrate the logical thinking related to the problems.	S2
3	**Values:**	
3.1	Show the collaboration and inter-professionalism in class discussions or team works, as well as solve problems independently.	V1, V2, V3
3.2	Respect intellectual property rights and scientific integrity, and take responsibility for professional development.	V2, V3

C. Course Content

No	List of Topics	Contact Hours
	Total	60

D. Teaching and Assessment

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

Code	Course Learning Outcomes	TeachingStrategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	Outline and learn to handle a scientific project.	• Lectures. • Office hours.	▪ Participation. ▪ Discussions.
1.2	Describe and state good project management skills.	• Lectures. • Office hours.	▪ Participation. ▪ Discussions.
1.3	Define and carry out a detailed and original piece of scientific research and communicate the results.	• Lectures. • Office hours.	▪ Participation. ▪ Discussions.
2.0	**Skills**		
2.1	Develop the students' ability to distinguish between	• Practical work. • project.	▪ Reports.

Code	Course Learning Outcomes	TeachingStrategies	Assessment Methods
	different physical phenomena related to project.		
2.2	**Show ability to deal with various sources of knowledge and the ability to exploit and to estimate the time.**	• Discussion. • Tasks and missions.	▪ Discussions. ▪ Assignments.
2.3	**Communicate in a clear and concise manner orally, and using IT for acquiring and analyzing information.**	• Discussion. • Mini projects provide opportunity to students to work in groups and to use the library. • Tasks and missions.	▪ Reports. ▪ Presentations. ▪ Assignments.
2.4	**Illustrate the logical thinking related to the problems.**	• Interactive discussions (special assignments in some courses will require students to search for data and/or information on their own). • Projects.	▪ Reports. ▪ Presentation.
3.0	**Values**		
3.1	**Show the collaboration and inter-professionalism in class discussions or team works, as well as solve problems independently.**	• Small team tasks • Open discussion. • Office hours.	▪ Participation. ▪ Discussion. ▪ Mini-project(s).
3.2	**Respect intellectual property rights and scientific integrity.**	• Small team tasks • Open discussion. • Office hours.	▪ Reports. ▪ Presentations. ▪ Assignments.

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	The final year project is compulsory and 100% based on continuous assessment, i.e. it must be passed at the end semester examinations.	**weekly**	**The final year project is an assessment of performance away from a formal examination**
2	1st Report written by supervisor on the advancement of the student's project	**4th Week**	**35 %**
3	2nd Report written by supervisor on the advancement of the student's project	**8th Week**	**35 %**
4	Final Oral Exam directed by an oral examination committee	**12th Week**	**30 %**

***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 :

- **Students will be assigned an academic advisor to give them the appropriate academic counseling and support.**
- **The lecturer will allocate 6 office hours per week. The assigned times will be advertised on the office door and reserved by the instructor as part of his teaching schedule.**
- **Students are able to get individual consultation appointment with teaching staff via email, phone calls and department website.**

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	
Essential References Materials	
Electronic Materials	
Other Learning Materials	

2. Facilities Required

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

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment, Quality of learning resources.	• **Students** • **Second assessor**	**During the semester and at the end of the course each student will complete two evaluation forms.**
Extent of achievement of course learning outcomes, Quality of	• **Instructor** • **Second assessor**	**At the end of each semester the course instructor should complete the course report, including a**

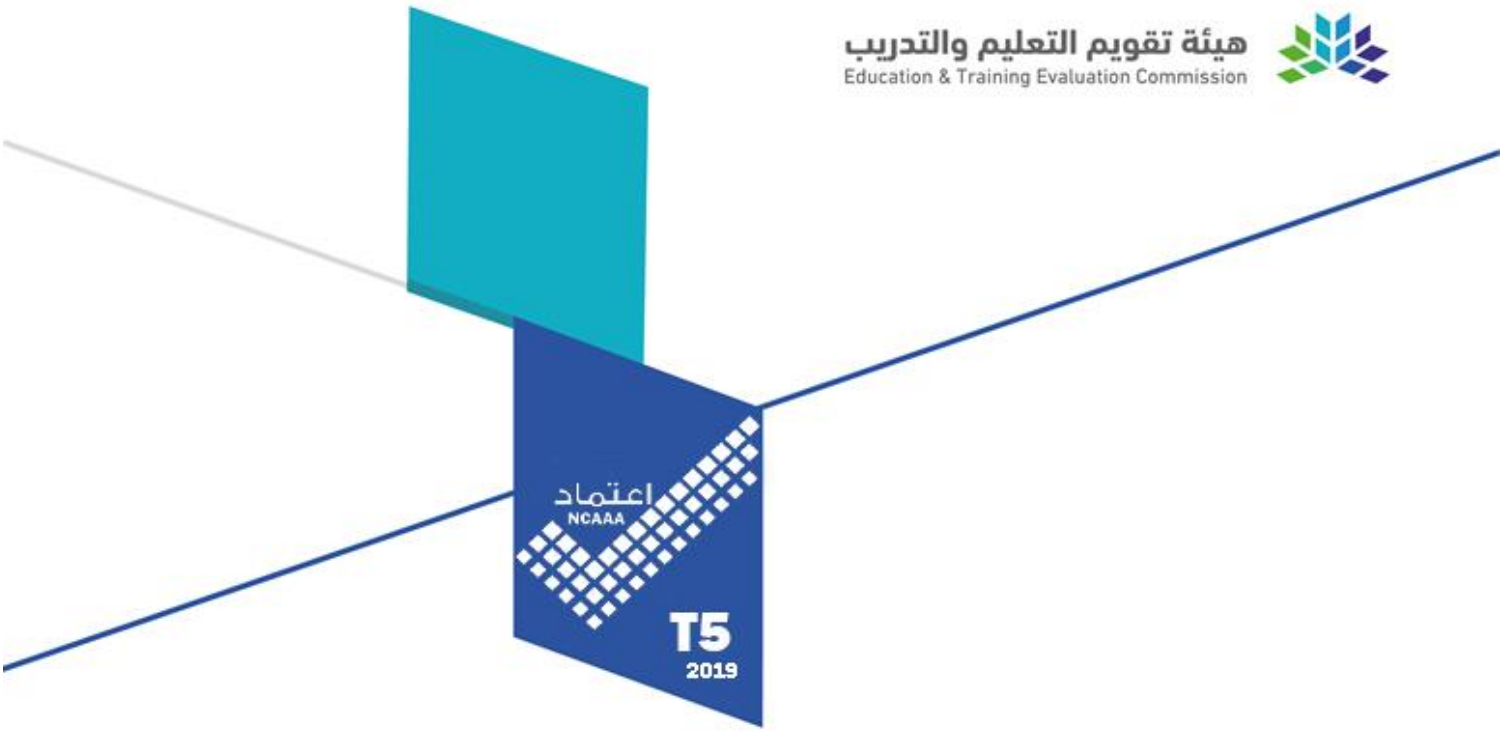
Evaluation Areas/Issues	Evaluators	Evaluation Methods
learning resources.		summary of student questionnaire responses appraising progress and identifying changes that need to be made if necessary.

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	Quality Unit-Physics Department
Reference No.	Department council No. 11
Date	16/11/2022

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission



Field Experience Specifications

Course Title:	**Field Training**
Course Code:	**PHY 1496**
Program:	**Bachelor of Science in Physics**
Department:	**Physics**
College:	**College of Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**

Table of Contents

A. Field Experience Identification

1. Credit hours: 4

2. Level/year at which this course is offered: 12/4 **(last term of the program).**

3. Dates and times allocation of field experience activities.

- Number of weeks: **(12) week**
- Number of days: **(36) day**
- Number of hours: **(180) hour**

Student Workload Information Guide

4. Pre-requisites to join field experience (if any)**:**

Student must have completed a minimum number of 160 credits

B. Learning Outcomes, and Training and Assessment Methods

1. Field Experience Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding** At the end of the field experience, the student is able to:	
1.1	Recognize knowledge of the context of the professional career before graduation.	K1, K2
1.2	Demonstrate an understanding of a range of professional interests in related fields of physics program.	K1, K2
1.3	Label all opportunities for learning, development and mentoring throughout the duration of the training.	K1, K2
2	**Skills:** At the end of the field experience, the student is able to:	
2.1	Apply what has been learned in classroom to real-world situations.	S1
2.2	Acquire new skills by becoming accustomed to critical and innovative for problem solving, thinking analysis and making practical decisions with confidence and rigor.	S1, S2
2.3	proficiently communicate oral and written information in a manner that reflects professional social work skills.	S4
2.4	Deal with the various pressures that he/she may face in the labor market.	S1
2.5	Proficiently interact and collaborate with other professionals.	S4
3	**Values:** At the end of the field experience, the student is able to:	
3.1	Develop discipline, self and social responsibility.	V1
3.2	Apply ethic principles of the profession.	V1
3.3	Enhance integrity and honesty.	V1

2.Alignment of Learning Outcomes with Training Activities and Assessment Methods

Code	Learning Outcomes	Training Methods/Activities	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	Recognize knowledge of the context of the professional career before graduation.	participation with the field supervisor at work place.	Discussion Specific rubric
1.2	Demonstrate an understanding of a range of professional interests in related fields of physics program.	Subject-based study essays written-short answer/long answer/report	Rubric of evaluation
1.3	Label all opportunities for learning, development and mentoring throughout the duration of the training.	Oral test Presentation Written report	Evaluate student's Discussion
2.0	**Skills** **The student is able to:**		
2.1	Apply what has been learned in classroom in the real-world situations.	workplace performance; Oral Presentations	• Portfolio • Student's diary/journal.
2.2	Acquire new skills by becoming accustomed to critical and innovative for problem solving, thinking analysis and making practical decisions with confidence and rigor.	Written research questions/ Reflection	Student portfolio
2.3	proficiently communicate oral and written information in a manner that reflects professional social work skills	Written tasks Discussion	Evaluation of Report and mails.
2.4	Deal with the various pressures that he/she may face in the labor market.	participation with the field supervisor at workplace	Direct observation
2.5	Proficiently interact and collaborate with other professionals	participation with the field supervisor at workplace	Direct observation
3.0	**Values** **The student is able to:**		
3.1	Develop discipline, self and social responsibility	Discussion, behavior	Portfolio and direct observation
3.2	Apply ethic principles of the profession.	Discussion, behavior	Direct observation portfolio
3.3	Enhance integrity and honesty	Discussion, behavior	Direct observation

3. Field Experience Learning Outcomes Assessment

a. Students Assessment Timetable

#	Assessment task*	Assessment timing (Week)	Percentage of Total Assessment Score
1	Depends on the workspace and the assessment plan of the field experience in collaboration between teaching staff and the assigned field supervisor before starting the training.	During the 10 weeks of the training.	20% for the evaluation of the teaching staff (5% on the attendance of the orientation session, 5% related to the performance during the field visit, 10% for the appreciation on student's performance by using supervisor's reports and student's weekly) and 80% reserved to the field supervisor regarding overall performance and progress during the training.
2			

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

b. Assessment Responsibilities

#	Category	Assessment Responsibility
1	**Teaching Staff**	The teaching staff supervisor assesses: • the attendance and participation of the student in the orientation session, • the performance during the field visit, • student's performance by using supervisor's reports and student's weekly, which express the application of student's knowledge to actual practice.
2	**Field Supervisor**	The field supervisor assesses overall performance and progress of the student during the training.
3	**Others** (specify)	**N.A.**

C. Field Experience Administration

1. Field Experience Locations

a. Field Experience Locations Requirements

Suggested Field Experience Locations	General Requirements*	Special Requirements**
• Saudi Standards, Metrology and Quality Organization • KACST • SABIC • ARAMCO • Public and private	• The workplace is registered and approved by the competent Saudi instances. • Legal status as determined by the law in Saudi Arabia. • Efficiency and safety	The field experience location activities are appropriate and consistent with the mission of Imam university and the requirements for field experience learning outcomes.

Schools		

*Ex: provides information technology ,equipment ,laboratories ,halls ,housing ,learning sources ,clinics etc.

**Ex: Criteria of the training institution or related to the specialization, such as: safety standards, dealing with patients in medical specialties, etc.

b. Decision-making procedures for identifying appropriate locations for field experience

Before starting the process for field experience, the college should state a range of partnerships with potential training organizations that may provide high-level training opportunities.
The list of partnerships should be available in college of science website.
These partnerships should be based on requirements listed above.
The college should communicate the present document (including qualifications and responsibilities) to the training organization to ensure skills requirements to determine an appropriate field supervisor.

2. Supervisory Staff

a. Selection of Supervisory Staff

Selection Items	Field Supervisor	Teaching Staff
Qualifications	A permanent member of the training organization.	A member of the teaching staff at the department of Physics is assigned authority and responsibility of supervising and evaluating the overall components of the field experience according the present specifications document.
Selection Criteria	depending to the training organization criteria.	• Ability to supervise a team, to establish priorities and manage competing deadlines for self and others. • Experience in the supervision and leadership of staff. • Well-developed oral and written communication skills. • Ability to build and maintain effective working relationships and act with diplomacy and discretion when dealing with sensitive and confidential issues • Ability to develop effective social and professional networks.

b. Qualification and Training of Supervisory Staff

(Including the procedures and activities used to qualify and train the supervisory staff on supervising operations, implementing training activities, the follow-up and evaluation of students, etc.)

The field supervisor is able for supervising, training and evaluating the student throughout the training period., including the follow-up and monitoring. He should notify the corresponding teaching staff of any concerns or problems. In addition, s/he the following key skills and qualifications:

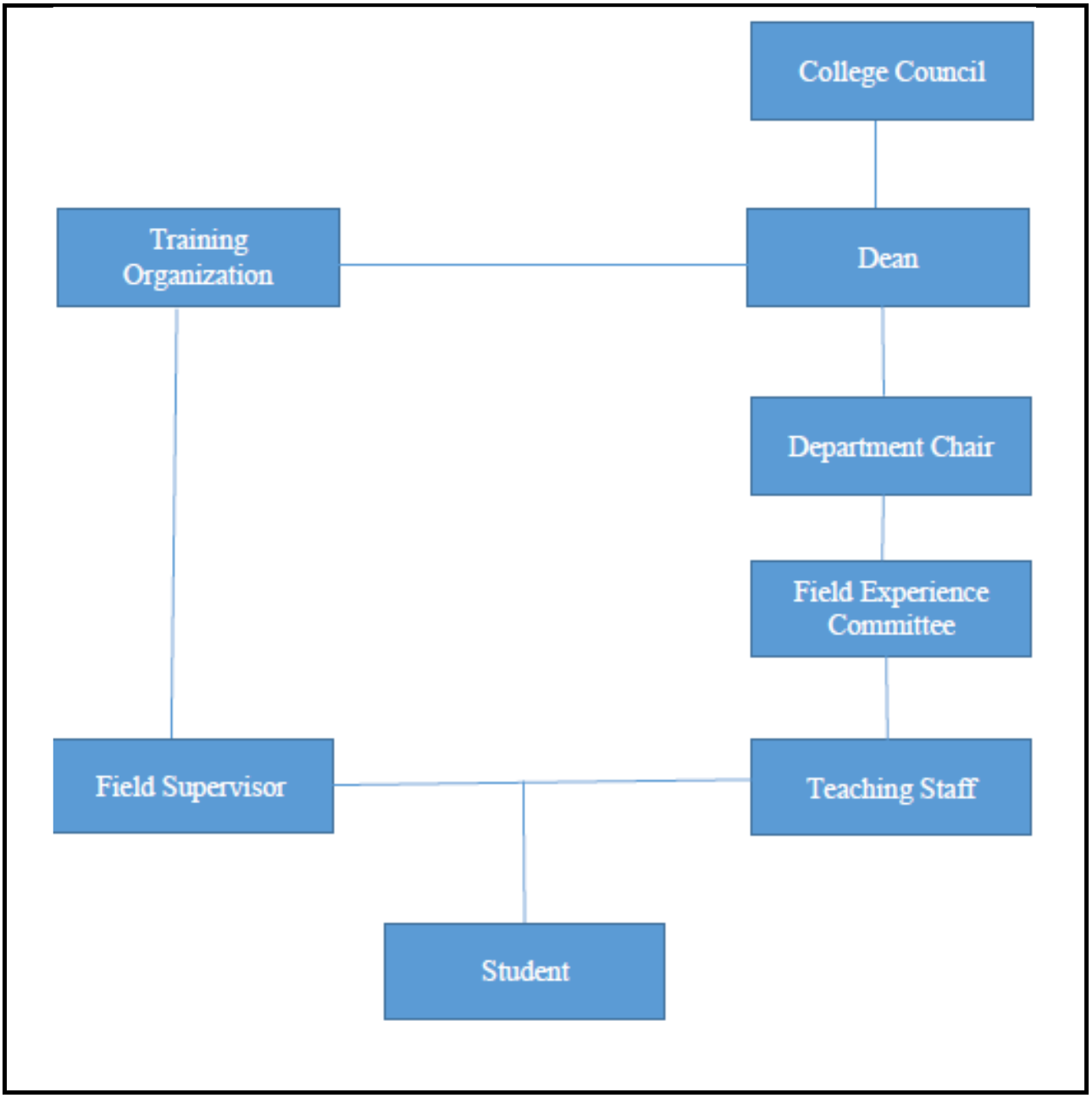
- Scientific academic path.
- Leadership and team management skills.
- Attention to detail and problem-solving skills.
- Written and verbal communication skills

- Advanced expertise in a specific training organization activities
- Deep knowledge of training organization policies.

3. Responsibilities

a. Field Experience Flowchart for Responsibility

including units, departments, and committees responsible for field experience, as evidenced by the relations between them.



b. Distribution of Responsibilities for Field Experience Activities

Activity	Department or College	Teaching Staff	Student	Training Organization	Field Supervisor
Selection of a field experience site	☑		☑		
Selection of supervisory staff	☑				

Activity	Department or College	Teaching Staff	Student	Training Organization	Field Supervisor
Provision of the required equipment				☑	
Provision of learning resources				☑	
Ensuring the safety of the site				☑	
Commuting to and from the field experience site		☑	☑		☑
Provision of support and guidance		☑			☑
Implementation of training activities (duties, reports, projects, ...)		☑			☑
Follow up on student training activities		☑			☑
Adjusting attendance and leave		☑			☑
Assessment of learning outcomes		☑			☑
Evaluating the quality of field experience	☑	☑	☑	☑	☑
Others (specify)					

4. Field Experience Implementation

a. Supervision and Follow-up Mechanism

The mechanism used for supervision and follow-up student is essentially based on:

- follow-up forms
- Interview follow-up
- Student portfolio
- Daily attendance record.
- Evaluation rubric

b. Student Support and Guidance Activities

Session of orientation, necessary documentations (forms and rubrics, and guide manual).
The workplace is expected to provide documents for student training (including internal policy manuals, electronic sources).
The workspace is expected to provide also appropriate desk gadgets including printer/internet

access with appropriate electronic devices and software.

5. Safety and Risk Management

Potential Risks	Safety Actions	Risk Management Procedures
• Physical, biological and chemical hazards.	• Identify potential risks. Talk to your teaching staff supervisor and field supervisor about specific risks related to your field • Know the numbers for emergency services at internship location and program into your mobile phone where appropriate.	Inform your internship advisor or teaching staff supervisor immediately.

G. Training Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Student performance, effectiveness and efficiency	Field Supervisor,	Direct and Indirect
Quality of learning resources Effectiveness of Training and assessment. Student performance	Teaching staff	Indirect
Evaluation of the field Experience (workspace, Quality of learning resources, supervisory, achievements, skills, behavior, time)	Student	Indirect

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

E. Specification Approval Data

Council / Committee	**Quality Unit-Physics Department**
Reference No.	**Department council No. 11**
Date	**16/11/2022**

Course name	Experiments	Number of copies	Students capacity	Equipments and components	Average number of students	Lab. Dimension	Number of Labs
General Physics Lab.	1. Experiment 1	10	30	Force table	20		1
				Slotted weights			
				Digital stopwatch			
	2. Experiment 2	10		Slotted mass hangers			
				Steel tape measure			
				Holding magnet			
	3. Experiment 3	10		Fork-type light barrier			
				Trolley			
				Track, 1.5 m			
	4. Experiment 4	10		Combination light barrier			
				Multimeters			
				Electronic timer			
	5. Experiment 5	10		Plug-in board			
				resistors			
				Low-voltage power supply			
	6. Experiment 6	10		Multi-corecable, 6-pole, 1.5m			
				Potentiometer			
				XXXXXXXXXXXXX			
	7. Experiment 7	10					
	8. Experiment 8	10					
	9. Experiment 9	10					
	10. Experiment 10	10					

Course name	Experiments	Number of copies	Students capacity	Equipments and components	Average number of students	Lab. Dimension	Number of Labs
Thermal Physics and Mechanics Lab. PHY 1283	11. Experiment 1	4	20	Rotational model	14		1
				Forked light barrier			
				Multi-corecable, l = 1.50 m			
	12. Experiment 2	4		Counter S			
				Maxwell wheel			
				Stopwatch, digital, 1/100 sec			
	13. Experiment 3	4		Gyroscope with 3 axes			
				Power supply 5V DC/2.4 A			
				Additional gyro-disc w. counter-weight			
	14. Experiment 4	4		Torsion pendulum after Pohl			
				Bridge rectifier, 30V AC/1A DC			
				Digital multimeter			
	15. Experiment 5	4		Variable transformer, 25V AC/ 20V DC, 12A			
				Dewar vessel calorimeter			
				Cover for Dewar vessel			
	16. Experiment 6	4		Balance			
				Thermometer –10°C to +110°C			
				Steam generator, 550W/220V			
	17. Experiment 7	4		Heating apparatus			
				Expansion apparatus			
				Holder for dial gauge			
	18. Experiment 8	4		Dial gauge			
				Steam generator, 550 W/230 V			
				J tube			
	19. Experiment 9	4		Dilatometer			
				Hot plate			
				Water separator			
	20. Experiment 10	4		XXXXXXXXXXXXX			

Course name	Experiments	Number of copies	Students capacity	Equipments and components	Average number of students	Lab. Dimension	Number of Labs
Waves and Optics Lab. PHY 1282	21. Experiment 1	4	20	Optical disk with 8 model objects. Transformer. Muli-slit slide	12		1
	22. Experiment 2	4		Light ray box Halogen lamp housing Transparency optical illusion			
	23. Experiment 3	4		Lenses Translucent screen Newton’s ring			
	24. Experiment 4	4		He-Ne laser, linearly polarized Fresnel’s mirror, adjustable Diaphragm with 3 single slits			
	25. Experiment 5	4		Diaphragm with 3 double slits Diaphragm with 4 double slits Light filters (red, green and blue)			
	26. Experiment 6	4		Polarization filters Prism table Spectrometer			
	27. Experiment 7	4		Spectral tube power supply and mount Copy of a Rowland grating, 600 lines/mm Spectral tubes			
	28. Experiment 8	4		XXXXXXXXXX			
	29. Experiment 9	4					
	30. Experiment 10	4					

Course name	Experiments	Number of copies	Students capacity	Equipments and components	Average number of students	Lab. Dimension	Number of Labs
Electromagnetism Lab. PHY 1281	31. Experiment 1	6	20	demountable capacitors power supply 450 V two-way switch	15		1
	32. Experiment 2	6		Voltmeters (analog & digital) electrometer amplifier apacitors			
	33. Experiment 3	6		plug-in board function generator two-channel oscilloscope			
	34. Experiment 4	6		teslameter axial B-probe tangential B-probe			
	35. Experiment 5	6		high current power supply Straight conductor Circular conductor loops			
	36. Experiment 6	6		coil with variable number of turns per unit length electron deflection tube Helmholtz pair of coils			
	37. Experiment 7	6		high voltage power supplies DC power supply 0-16V / 0-5A safety connection leads			
	38. Experiment 8	6		Resistors Inductors Coil 1000 turns			
	39. Experiment 9	6		XXXXXXXXXX 			
	40. Experiment 10	6		 			

Course name	Experiments	Number of copies	Students capacity		Average number of students	Lab. Dimension	Number of Labs
Electronics Lab. PHY 1382	41. Experiment 1	8	20	Resistors	18		1
				Capacitors			
				Potentiometers			
	42. Experiment 2	8		Transistors			
				Operational amplifier			
				Diodes			
	43. Experiment 3	8		AC/DC stabilizer (-15V).to.(+15V)/1A			
				Multimeters (digital & analog)			
				two-channel oscilloscope			
	44. Experiment 4	8		Power supply unit			
				Plug-in board			
				Function generator			
	45. Experiment 5	8		XXXXXXXXXXXXX			
	46. Experiment 6	8					
	47. Experiment 7	8					
	48. Experiment 8	8					
	49. Experiment 9	8					
	50. Experiment 10	8					

Course name	Experiments	Number of copies	Students capacity		Average number of students	Lab. Dimension	Number of Labs
Solid State Physics Lab. PHY 1481	51. Experiment 1	2	16	Electromagnet	10		1
				Planck's constant measuring instrument			
				Digital Gaussmeter			
	52. Experiment 2	2		Hall effect apparatus			
				Constant current power supply			
				AC & DC power supply			
	53. Experiment 3	2		Single output adjustable power supply			
				Regulated E.H.T power supply unit			
				Teslameter			
	54. Experiment 4	2		Microvoltmeter			
				Variable extra low voltage transformer			
				Two channel oscilloscope			
	55. Experiment 5	2		Multimeters			
				Spectral lamp, Cd, with holding plate.			
				Electron spin resonance apparatus			
	56. Experiment 6	2		X-ray apparatus			
				Electron diffraction tube			
				High voltage power supply			
	57. Experiment 7	2		Polarization filters			
				High current power supply			
				Lab top			
	58. Experiment 8	2		Cadmium lamp			
				Fabry-Perot etalon			
				XXXXXXXX			
	59. Experiment 9	2					

	60. Experiment 10	2					