Ministry of Higher Education and Scientific Research
Scientific Supervision and Scientific Evaluation Apparatus
Directorate of Quality Assurance and Academic Accreditation
Accreditation Department

Academic Program and Course Description Guide

2024

Introduction:

The educational program is a well-planned set of courses that include procedures and experiences arranged in the form of an academic syllabus. Its main goal is to improve and build graduates' skills so they are ready for the job market. The program is reviewed and evaluated every year through internal or external audit procedures and programs like the External Examiner Program.

The academic program description is a short summary of the main features of the program and its courses. It shows what skills students are working to develop based on the program's goals. This description is very important because it is the main part of getting the program accredited, and it is written by the teaching staff together under the supervision of scientific committees in the scientific departments.

This guide, in its second version, includes a description of the academic program after updating the subjects and paragraphs of the previous guide in light of the updates and developments of the educational system in Iraq, which included the description of the academic program in its traditional form (annual, quarterly), as well as the adoption of the academic program description circulated according to the letter of the Department of Studies T 3/2906 on 3/5/2023 regarding the programs that adopt the Bologna Process as the basis for their work.

In this regard, we can only emphasize the importance of writing an academic programs and course description to ensure the proper functioning of the educational process.

Concepts and terminology:

Academic Program Description: The academic program description provides a brief summary of its vision, mission and objectives, including an accurate description of the targeted learning outcomes according to specific learning strategies.

Course Description: Provides a brief summary of the most important characteristics of the course and the learning outcomes expected of the students to achieve, proving whether they have made the most of the available learning opportunities. It is derived from the program description.

Program Vision: An ambitious picture for the future of the academic program to be sophisticated, inspiring, stimulating, realistic and applicable.

Program Mission: Briefly outlines the objectives and activities necessary to achieve them and defines the program's development paths and directions.

Program Objectives: They are statements that describe what the academic program intends to achieve within a specific period of time and are measurable and observable.

Curriculum Structure: All courses / subjects included in the academic program according to the approved learning system (quarterly, annual, Bologna Process) whether it is a requirement (ministry, university, college and scientific department) with the number of credit hours.

Learning Outcomes: A compatible set of knowledge, skills and values acquired by students after the successful completion of the academic program and must determine the learning outcomes of each course in a way that achieves the objectives of the program.

Teaching and learning strategies: They are the strategies used by the faculty members to develop students' teaching and learning, and they are plans that are followed to reach the learning goals. They describe all classroom and extra-curricular activities to achieve the learning outcomes of the program.

Academic Program Description Form

University Name: University of Diyala

Faculty/Institute: Collage of Science

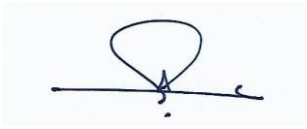
Scientific Department: Department of Physics

Academic or Professional Program Name: .....

Final Certificate Name: Bachelor's Degree (B.Sc.) – Physics Science

Academic System: .....

Description Preparation Date: / / 2024

Signature: 

Head of Department Name:

Prof. Dr. Ammar Ayesh Habeeb

Date:20–3–2024

Signature: 

Scientific Associate Name:

Prof. Dr. Munther Hamza Radhi

Date: 20–3–2024

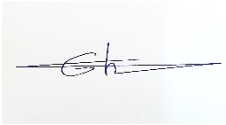
The file is checked by: Assist Prof Ghasan Sabeeh Mahmood

Department of Quality Assurance and University Performance

Director of the Quality Assurance and University Performance Department:

Assist Prof Ghasan Sabeeh Mahmood

Date: 20–3–2024

Signature: 

Approval of the Dean

Prof. Dr. Taha Mohammad Hasan

1. Program Vision

Welcome to the department of physics science at the university of Diyala. We are a growing, world-class department with strong programs in research and academics, nationally and internationally recognized faculty members. We pursue to provide students with access to the cutting-edge research efforts of a larger institution, while still maintaining the level of personal interaction with faculty found at smaller places. We are contributing a fundamental new knowledge at the cutting-edge of physics science and provide outstanding educational opportunities through research, teaching, and outreach. The department of physics enabling to establish a platform for the dissemination and creation of knowledge through teaching and research in Physics at various levels

2. Program Mission

The goal of the undergraduate physics program is to help students develop learning skills, problem solving techniques and professional ethics and attitudes that will support their further academic work or future employment in their technical or career of choice, through the study of physics science. Students in this program develop strong analytical, quantitative, and problem-solving skills, including a deep appreciation for connections between physics and scientific computing, physics and engineering, or physics and mathematics, to expand their career options in computer hardware/software companies, large semiconductor industries and many job sectors such as finance and business. In addition to the pure physics science, our program performs frontier studies and researches in the medical physics by focusing on medical imaging, radiotherapy, biomagnetism, and radiation metrology. We are committed to develop tools and methods that will benefit patients in our community and/or worldwide clinics. The medical physicist is not only tasked with the effective and accurate operation of existing tools, but also to continue developing new techniques that better meet the medical increasing demands. Therefore, our program awards graduate a Bachelor of Science (B.S.) either in Pure Physics and/or Medical Physics based on the majors of student's studies.

3. Program Objectives

Study the physics to gain a broad knowledge base and a problem-solving skill set that is in demand across a variety of exciting industries. Physics is the study of matter and energy and how they interact. In addition to these physical concepts, we also require our students to attain sufficient knowledge of other sciences such as mathematics and computer to support their upper-level courses and their application to our world. They can develop laboratory skills throughout our curriculum via hands-on experiences with diverse experimental techniques and tools. Graduates with a B.S. in science major, student can pursue advanced degrees in a variety of subjects or hit the job market directly, seeking work in laboratory or research settings in both public and private sectors. To do that, our program objectives include a mastery of the following:

1. To create human resources with strong foundation in Physics which can be applied to wide areas in science and technology.

2. Create qualified undergraduates who have basic skills in using observation and analytical equipment, and also able to explain physical phenomena.
3. To provide students with knowledge and understanding of the fundamental principles and technologies that underpin the discipline of physics.
4. Give students technical expertise in physics science and practical experience enabling them to be effective in a varied and fast-developing range of careers in physics.
5. Obtain research results and innovative works in physics field, either theoretically or experimentally that lead to provide information about research results in a national or international forum which supports competence for graduating.
6. Apply research results and innovative works to solve problems faced by the society using the knowledge of physics.
7. To carry out research through collaboration with researchers of other reputed academic institutions of Iraq and abroad.
8. To organize outreach activities to promote scientific culture.
9. To provide a motivating and inclusive environment with the opportunity to develop themselves intellectually and socially and to encourage students to develop as independent and self-critical problem solvers.
10. To prepare students for continued study at an advanced level, either in formal postgraduate study or as continued professional development.
11. To provide communication skill in physics majors through effectively communicate their results using written reports and oral presentations.

4. Program Accreditation

Does the program have program accreditation? And from which agency?

The program is sponsor by Ministry of Higher Education and Scientific Research in Iraq.

5. Other external influences

Is there a sponsor for the program?

By Ministry of Higher Education and Scientific Research in Iraq only.

6. Program Structure

Program Structure	Number of Courses	Credit hours	Percentage	Reviews*
Institution Requirements	4	9	4	
College Requirements	4	19	8	
Department	60	250	85	

Requirements				
Summer Training	**1**	**6**	**3**	
Other				

* This can include notes whether the course is basic or optional.

7-1 Program Description

Year/Level	Course Code	Course Name	Credit Hours Theoretical	Credit Hours Practical (Lab)
FIRST/ First-Semester	PHY-101	Principle of mechanics	2	2
FIRST/ First-Semester	PHY-111	Electricity	2	2
FIRST/ First-Semester	MATH-101	Differentials Method	2	
FIRST/ First-Semester	PHY-114	General Astronomy	2	
FIRST/ First-Semester	UNI-103	Democrat & Hunan Right	2	
FIRST/ First-Semester	UNI-101	Arabic Language	2	
			Total=12	Total= 4
Year/Level	**Course Code**	**Course Name**	**Credit Hours Theoretical**	**Credit Hours Practical (Lab)**
FIRST/ Second-Semester	PHY-102	Properties of Modern Physics	2	2
FIRST/ Second-Semester	PHY-112	Heat and thermodynamics	2	2
FIRST/ Second-Semester	MATH-102	Nautical Mechanic II	2	
FIRST/ Second-Semester	SCL-123	Digital Electronic	2	2
FIRST/ Second-Semester	SCL-125	Liner Algebra	2	
FIRST/ Second-Semester	UNI-102	Sound &Wave Motion	2	2
			Total=12	Total= 8

7-2 Program Description

Year/Level	Course Code	Course Name	Credit Hours Theoretical	Credit Hours Practical (Lab)
Second / First-Semester	PHY-231	Properties of Modern physics	2	2

Second / First–Semester	PHY–241	Heat & Thermodynamic	2	2
Second / First–Semester	MATH–204	Analytical Mechanics I	2	
Second / First–Semester	PHY–211	Analog Electronics	2	2
Second / First–Semester	MATH–203	Differential Equation	2	
Second / First–Semester	COMP–203	Matlab language programing		2
			Total=10	Total= 8
Year/Level	Course Code	Course Name	Credit Hours Theoretical	Credit Hours Practical (Lab)
Second / First–Semester	PHY–232	Modern physics	2	2
Second / First–Semester	PHY–242	Thermodynamic & Statistical	2	2
Second / First–Semester	PHY–202	Analytical Mechanics II	2	
Second / First–Semester	PHY–212	Digital Electronics	2	2
Second / First–Semester	MATH–204	Liner Algebra	2	
Second / First–Semester	PHY––226	Sound and Wave Motion	2	2
			Total=12	Total= 8

7–3 Program Description

Year/Level	Course Code	Course Name	Credit Hours Theoretical	Credit Hours Practical (Lab)
Third/ First–Semester	PHY–321	Geometrical optics	2	2
Third/ First–Semester	PHY–304	Principal of Laser Physics	2	2
Third/ First–Semester	PHY–301	Principal of Quantum Mechanics	2	
Third/ First–Semester	PHY–324	Introduction in Material Physics	2	2
Third/ First–Semester	MATH–305	Numerical Analysis	2	1
Third/ First–Semester	PHY–370	Optimal 1	2	
			Total=12	Total= 7
Year/Level	Course Code	Course Name	Credit	Credit Hours

			Hours Theoretical	Practical (Lab)
Third / First–Semester	PHY–322	Physical Optics	2	2
Third/ Second–Semester	PHY–305	Laser physics	2	2
Third / First–Semester	PHY–302	Quantum Mechanics	2	
Third / First–Semester	PHY–325	Material Physics	2	2
Third / First–Semester	MATH–306	Complex Analysis	2	
Third / First–Semester	PHY––371	Optional 2	2	
			Total=12	Total= 6

7–4 Program Description

Year/Level	Course Code	Course Name	Credit Hours Theoretical	Credit Hours Practical (Lab)
Fourth/ First–Semester	PHY–431	Principal of Nuclear Physics	2	2
Fourth / First–Semester	PHY–441	Principal of Solid State Physics	2	2
Fourth/ First–Semester	PHY–411	Basic of Electromagnetic Theory	2	
Fourth/ First–Semester	PHY–451	Mathematical Physics	2	
Fourth/ First–Semester	PHY–472	Optimal 3	2	
Fourth/ First–Semester	PHY–408	Research Methodology	2	
			Total=12	Total= 4
Year/Level	Course Code	Course Name	Credit Hours Theoretical	Credit Hours Practical (Lab)
Fourth/ Second–Semester	PHY–432	Nuclear Physics	2	2
Fourth/ Second–Semester	PHY–442	Solid State Physics	2	2
Fourth/ Second–Semester	PHY–412	Electromagnetic Theory	2	
Fourth/ Second–Semester	PHY–452	Plasma Physics	2	
Fourth/ Second–Semester	PHY–473	Optional 4	2	
Fourth/ Second–Semester	PHY––408	Research Project	2	
			Total=12	Total= 4

1. Expected learning outcomes of the program	
Knowledge	
Learning Outcomes 1	Graduates have significant knowledge of the theories that form the basis of classical mechanics, electromagnetism, quantum mechanics, and thermodynamic. Graduates will be able to demonstrate a balanced concept of how scientific knowledge develops, including the historical development of foundational theories and laws and the nature of physics science.
Skills	
Learning Outcomes 2	Graduates will be able to formally communicate the results of physical results and investigations using both oral and written communication skills,
Learning Outcomes 3	Graduates will be able to perform laboratory experiments and field studies, by using scientific equipment and computer technology while observing appropriate safety protocols.
Ethics	
Learning Outcomes 4	Graduates will be able to demonstrate scientific quantitative skills, such as the ability to conduct simple data analyses.
Learning Outcomes 5	Graduates will be able to use critical-thinking and problem-solving skills to develop a research project and/or manuscript.

2. Teaching and Learning Strategies

The Physics Department is committed to providing an exceptional education to our students. To that aim, we have updated our graduate program learning objectives to better align us with our Statement of Principles and the ever-advancing world. Students will acquire a general foundational knowledge of physics at the graduate level and the necessary accompanying methodological aspects of mathematics, computing, and instrumentation. Students will learn to identify and solve problems at the frontier of physics knowledge, uphold standards of scientific integrity, and disseminate their research. Student can use a scientific experimental apparatus to study the physical phenomena that release new ideas and results. Based on this knowledge, students understand the interrelations between theory and observation; the role of systematic and random experimental errors and methods used to analyze experimental uncertainty and compare experiment with theory. With this varied expertness, students can share or exchange information and scientific ideas effectively in both orally and writing. Based on medical Physics branch, student can be learning a significant number of tools and techniques that proven an effectiveness in modern medical practice.

3. Evaluation methods

Based on this knowledge, students understand the interrelations between theory and observation; the role of systematic and random experimental errors and methods used to analyze experimental uncertainty and compare experiment with theory. With this varied expertness, students can share or exchange information and scientific ideas effectively in both orally and writing.

4. Faculty

Faculty Members

Academic Rank	Specialization		Special Requirements/Skills (if applicable)		Number of the teaching staff	
	General	Special			Staff	Lecturer
Prof. Dr. Sabah Anwar Salman	Physics	Solid state Physics			Staff	
Prof. Dr. Nabeel Ali Bakr	Physics	Thin Films, Solar Cells			Staff	
Prof. Dr. Asaad Ahmed kamil	Physics	Philosophy in Physics			Staff	
Prof. Dr. Muhammad Hameed Abduallah	Physics	Solid state Physics			Staff	
Prof. Dr. Ziad Tariq Khodair	Physics	Solid State Physics and Nanomaterial's			Staff	
Prof. Firas Mahmood Hady	Physics	Nuclear physics			Staff	
Prof. Mehdi Hatem Diwan	Physics	Solid state physics			Staff	
Assist. Prof. Dr. Olfat Ahmed Mahmood	Physics	Solid & Materials			Staff	
Assist. Prof. Dr. Ammar Ayesh Habeeb	Physics	Laser Application			Staff	
Assist. Prof. Dr. Rudaina Ali Lateef	Physics	Plasma Physics			Staff	

Assist. Prof. Dr. Jassim Muhamed Mansoor	Physics	Nanotechnology			Staff	
Assist. Prof. Dr. Omar Ahmed Mwafaq	Physics	Nuclear Physics			Staff	
Assist. Prof. Dr. Nadia Mohammed Jassim	Physics	Laser Spectra			Staff	
Assist. Prof. Dr. Jasim Mohammed Khalil	Physics	Atmospheric Phenomenology			Staff	
Assist. Prof. Dr. Faisal Ghazi Hamoudi	Physics	Philosophy in Physics			Staff	
Assist. Prof. Dr. Nada Suhail Ahmed	Physics	Laser and Molecular			Staff	
Assist. Prof. Dr.Yaqub Mohammed Jawad	Physics	Solid State and Materials Physics			Staff	
Assist. Prof. Dr. Jaafar Sadiq Mohammed	Physics	Thin Film and Image Processing			Staff	
Assist. Prof. Dr. Gailan Asaad Kazem	Physics	Applied Physics			Staff	
Lect. Dr. Firas Abed Ahmed	Physics	Nuclear Physics			Staff	
Assist. Prof. Hind Walid Abdullah	Physics	Materials			Staff	
Assist. Prof. Zena Mohammed Ali Abbas	Physics	Solid state Physics			Staff	
Lect. Jasim Mohammed Abduleteef	Physics	Solid state Physics			Staff	
Lect. Areej AbdulJalil	Physics	High Energy Physics			Staff	

Lect. Dr. Nada Ismail Ibrahim	Physics	Progeny			Staff	
Lect. Ahmed Nsaif Jasim	Physics	Solid state Physics			Staff	
Lect. Zaid Abdulhadi Abed	Physics	Quantum Physics			Staff	
Lect. Ali Hayder Redha	Physics	High Energy Physics			Staff	
Assist. Lect. Amera Kanaan Asfour	Physics	Physics			Staff	
Assist. Lect. Sabreen Abdulkareem hameed	Physics	Solid state Physics			Staff	
Assist. Lect. Zainab Saad Mahdi	Physics	Solid state Physics			Staff	
Assist. Lect. Mhammed Alwan Kadhum	Physics	Solid state physics			Staff	
Assist. Lect. Wafaa Abdulsatar Shatti	Physics	Solid state Physics			Staff	
Assist. Lect. Alyaa Hussein	Physics	Solid state Physics			Staff	
Assist. Lect. Rafid M. Abdullah	Physics	Solid state Physics			Staff	

Professional Development

Mentoring new faculty members

At physics institute, all faculty members with different majority were processed for full-time and there are not part-time faculty members at the present time.

Professional development of faculty members

Stimulating the research aspect of the academic program at physics department, various applications of the required learning outcomes and methods of teaching, learning and evaluation. Therefore, different professional development plan was applied to enhance the education level in the department that makes the faculty members use high education assessment methods and/or ways. Each faculty members has own teaching and learning methods discussions – theoretical scientific lectures – seminars, and workshops (in personal and /or team work)

Furthermore, all the test such as Written exams – oral exams, daily tests – individual work to solve problems such as homework.

5. Acceptance Criterion

The enrollment or admission process in the college is satisfied based on the Ministry of Higher Education and Scientific Research in Iraq only while monitoring student's performance is in the physic institutions. Central admission controls of the Ministry of Higher Education and Scientific Research for middle school graduates and first year Institutes. For instant, evaluating the students' performance in the laboratories through the discussing laboratory projects and/or class.

6. The most important sources of information about the program

The sources of information of the program based on the plan of Ministry of Higher Education and Scientific Research in Iraq. Furthermore, the department's website on the University of Dyala.

7. Program Development Plan

The planning and development process is carried out through feedback from the Council of Experts, the Scientific Methods Committees, and the Scientific Methods Committee. Experts for laboratory committees in accordance with the Ministry's requirement.

Program Skills Outline															
				Required program Learning outcomes											
Year/Level	Course Code	Course Name	Basic or optional	Knowledge				Skills				Ethics			
				A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4
FIRST/ First-Semester	PHY-101	Principle of mechanics	Basic	√	√	√		√	√	√		√	√	√	
FIRST/ First-Semester	PHY-111	Electricity	Basic	√	√	√		√	√	√		√	√	√	
FIRST/ First-Semester	MATH-101	Differentials Method	Basic	√	√	√		√	√	√		√	√	√	
FIRST/ First-Semester	PHY-114	General Astronomy	Basic	√	√	√		√	√	√		√	√	√	
FIRST/ First-Semester	UNI-103	Democrat & Hunan Right	Basic	√	√	√		√	√	√		√	√	√	
FIRST/ First-	UNI-101	Arabic Language	Basic	√	√	√		√	√	√		√	√	√	

Semester															
FIRST/ Second- Semester	**PHY-102**	**Properties of Modern Physics**	**Basic**	**V**	**V**	**V**		**V**	**V**	**V**		**V**	**V**	**V**	
FIRST/ Second- Semester	**PHY-112**	**Heat and thermodynamics**	**Basic**	**V**	**V**	**V**		**V**	**V**	**V**		**V**	**V**	**V**	
FIRST/ Second- Semester	**MATH-102**	**Nautical Mechanic II**	**Basic**	**V**	**V**	**V**		**V**	**V**	**V**		**V**	**V**	**V**	
FIRST/ Second- Semester	**SCL-123**	**Digital Electronic**	**Basic**	**V**	**V**	**V**		**V**	**V**	**V**		**V**	**V**	**V**	
FIRST/ Second- Semester	**SCL-125**	**Liner Algebra**	**Basic**	**V**	**V**	**V**		**V**	**V**	**V**		**V**	**V**	**V**	
FIRST/	**UNI-102**	**Sound &Wave Motion**	**Basic**	**V**	**V**	**V**		**V**	**V**	**V**		**V**	**V**	**V**	

Second–Semester															
Second / First–Semester	PHY–231	Properties of Modern physics	Basic	✓	✓	✓		✓	✓	✓		✓	✓	✓	
Second / First–Semester	PHY–241	Heat & Thermodynamic	Basic	✓	✓	✓		✓	✓	✓		✓	✓	✓	
Second / First–Semester	MATH–204	Analytical Mechanics I	Basic	✓	✓	✓		✓	✓	✓		✓	✓	✓	
Second / First–Semester	PHY–211	Analog Electronics	Basic	✓	✓	✓		✓	✓	✓		✓	✓	✓	
Second / First–Semester	MATH–203	Differential Equation	Basic	✓	✓	✓		✓	✓	✓		✓	✓	✓	

Second /First– Semester	COMP–203	Matlab language programing	Basic	v	v	v		v	v	v		v	v	v	
Second / First– Semester	PHY–232	Modern physics	Basic	v	v	v		v	v	v		v	v	v	
Second / First– Semester	PHY–242	Thermodynamic & Statistical	Basic	v	v	v		v	v	v		v	v	v	
Second / First– Semester	PHY–202	Analytical Mechanics II	Basic	v	v	v		v	v	v		v	v	v	
Second / First– Semester	PHY–212	Digital Electronics	Basic	v	v	v		v	v	v		v	v	v	
Second / First–	MATH–204	Liner Algebra	Basic	v	v	v		v	v	v		v	v	v	

Semester															
Second / First– Semester	PHY—226	Sound and Wave Motion	Basic	٧	٧	٧		٧	٧	٧		٧	٧	٧	
Third/ First– Semester	PHY–321	Geometrical optics	Basic	٧	٧	٧		٧	٧	٧		٧	٧	٧	
Third/ First– Semester	PHY–304	Principal of Laser Physics	Basic	٧	٧	٧		٧	٧	٧		٧	٧	٧	
Third/ First– Semester	PHY–301	Principal of Quantum Mechanics	Basic	٧	٧	٧		٧	٧	٧		٧	٧	٧	
Third/ First– Semester	PHY–324	Introduction in Material Physics	Basic	٧	٧	٧		٧	٧	٧		٧	٧	٧	
Third/ First– Semester	MATH–305	Numerical Analysis	Basic	٧	٧	٧		٧	٧	٧		٧	٧	٧	
Third/ First– Semester	PHY–370	Optimal 1	Basic	٧	٧	٧		٧	٧	٧		٧	٧	٧	
Third / First–	PHY–322	Physical Optics	Basic	٧	٧	٧		٧	٧	٧		٧	٧	٧	

Semester															
Third/ Second- Semester	PHY-305	Laser physics	Basic	✓	✓	✓		✓	✓	✓		✓	✓	✓	
Third / First- Semester	PHY-302	Quantum Mechanics	Basic	✓	✓	✓		✓	✓	✓		✓	✓	✓	
Third / First- Semester	PHY-325	Material Physics	Basic	✓	✓	✓		✓	✓	✓		✓	✓	✓	
Third / First- Semester	MATH-306	Complex Analysis	Basic	✓	✓	✓		✓	✓	✓		✓	✓	✓	
Third / First- Semester	PHY--371	Optional 2	Basic	✓	✓	✓		✓	✓	✓		✓	✓	✓	
Fourth/ First- Semester	PHY-431	Principal of Nuclear Physics	Basic	✓	✓	✓		✓	✓	✓		✓	✓	✓	
Fourth / First-	PHY-441	Principal of Solid State Physics	Basic	✓	✓	✓		✓	✓	✓		✓	✓	✓	

Semester															
Fourth/ First– Semester	PHY–411	Basic of Electromagnetic Theory	Basic	✓	✓	✓		✓	✓	✓		✓	✓	✓	
Fourth/ First– Semester	PHY–451	Mathematical Physics	Basic	✓	✓	✓		✓	✓	✓		✓	✓	✓	
Fourth/ First– Semester	PHY–472	Optimal 3	Basic	✓	✓	✓		✓	✓	✓		✓	✓	✓	
Fourth/ First– Semester	PHY–408	Research Methodology	Basic	✓	✓	✓		✓	✓	✓		✓	✓	✓	
Fourth/ Second– Semester	PHY–432	Nuclear Physics	Basic	✓	✓	✓		✓	✓	✓		✓	✓	✓	
Fourth/	PHY–442	Solid State Physics	Basic	✓	✓	✓		✓	✓	✓		✓	✓	✓	

Second–Semester															
Fourth/ Second–Semester	PHY–412	Electromagnetic Theory	Basic	✓	✓	✓		✓	✓	✓		✓	✓	✓	
Fourth/ Second–Semester	PHY–452	Plasma Physics	Basic	✓	✓	✓		✓	✓	✓		✓	✓	✓	
Fourth/ Second–Semester	PHY–473	Optional 4	Basic	✓	✓	✓		✓	✓	✓		✓	✓	✓	
Fourth/ Second–Semester	PHY––408	Research Project	Basic	✓	✓	✓		✓	✓	✓		✓	✓	✓	

- **Please tick the boxes corresponding to the individual program learning outcomes under evaluation.**

Course Description Form

1. Course Name:
English language
2. Course Code:
UD102
3. Semester / Year:
2\2024
4. Description Preparation Date:
22/11/2023
5. Available Attendance Forms:
In attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
50\2
7. Course administrator's name (mention all, if more than one name)
Name: M. H. Al-Timimi Email: MohamedAltimimi@uodiyala.edu.iq
8. Course Objectives

Course Objectives	• The module aims to develop th students' English skills in readir writing, listening and speaking… • ….. • …..
9. Teaching and Learning Strategies	
Strategy	Headway's trusted methodology combines solid grammar and practice, vocabulary development, and integrated skills with communicative role-plays and personalization. Authentic material from a variety of sources enables students to see new language i context, and a range of comprehension tasks, language and vocabulary exercises, an extension activities practice the four skills. 'Everyday English' and 'Spoken grammar sections practice real-world speaking skills, and a writing section for each unit at th back of the book provides models for students to analyze and imitate.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	GRAMMAR, READING,MAIN COURSE SPEAKING, LISTENING,	Hello	Inattendance, students have grou for dialogue, in addition to	Formative assessment\ the exams J; Betty's assignme
2	2	VOCABULARY He/she/they Hs/her.where is he from Countries,	Your world	homework, daily an monthly exams, and the preparation of reports and project on specific topics.	Seminars Summative evaluation\ Midterm test final exam
3	2	Numbers 10-20,	All about You		
4	2	Verb to be, negative, questions, short answers Possessive adjectives Possessive 's. Has/ ha			
5	2	Adjective + noun Irregular Plurals, the family	Familyand friend		
6	2				
7	2	Present Simple: I/you/we/they a/an Adjective + noun Present Simple: He/s Question and negativ	The way I live		
8	2	Adverbs of frequency Question words Subje Pronouns Object Pronouns Possessive Pronouns This and th There is /are Prepositions: in, on, under, next to	Every day My favorites		
9	2	Vancouver-the best c in the world, What to and where to go	Where I live		

10	2	Was/were born Past simple: irregular verb			
11	2	It's a Jackson Pollock. Telling a story from pictures, Saying the			
12	2	dates in English Past Stoirple - irngda rerts	Time past		
13	2	Past simple: regular a irregular Questions Negatives			
14	2	Can / can't, Adverbs, Adjective + noun Requests and offers			
15	2	Some and any	We had a great time!		
		I'd like, You are what you eat, Discussion- what is a good diet? Conversation with Adam, Present Continuous Presert Simple	I can do that!		
		Future plans, Revisio question words, tens Seven countries in seven days	Please and thank You		
		Irregular verbs, phonetic symbols, consonants and vowe	here and now		
			its time to go!		
			Verbs and phone symbols		

11. Course Evaluation

Formative Assessment
Tests2 hours 5%(5) weight/weeks 5 10 12 15
Homework/6 hours/(20%) 20/2weeks 4 6 8 10 12
Seminars/2 hours/2% 5(5)Weight/weeks Continuous
Summary Assessment /

Midterm Exam /2 Hours / Weight 20% (10) / Week 7 Final exam / three hours / 50% (50) weight / week 16 Overall Rating 100

12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	New Headway Beginner, by liza john soars
Main references (sources)	
Recommended books and references (scientific journals, reports…)	
Electronic References, Websites	https://www.learnenglish.de/ https://www.englishgrammar.org/ https://www.phrasebank.manchester.ac.uk/

Course Description Form

13. Course Name:
Mathematical 1
14. Course Code:
COS-101
15. Semester / Year:
1\2024
16. Description Preparation Date:
1-4-2024
17.Available Attendance Forms:
In attendance
18.Number of Credit Hours (Total) / Number of Units (Total)
8\30
19. Course administrator's name (mention all, if more than one name)
Name: Firas Abed Ahmed Email: FirasAbedAhmed@uodiyala.edu.iq
20. Course Objectives

Course Objectives	This academic curriculum is a basic introduction to learning the basics of calcu trigonometric, logarithmic and exponential functions. The student will learn methods solution and application. The module aims to: 1- The objective required of the student in order to successfully pass the requirement the course is to teach the student to make derivations for all mathematical functions, as as the methods of drawing them. 2- The student's knowledge of distinguishing between functions and drawing them

	3- Developing the student's ability to understand the concept of differentiation and applications……

21. Teaching and Learning Strategies

Strategy	The main strategy that will be : A1- Students' ability to distinguish and cognitive perception (to diagnose general theories and principles in the study) A2-Future planning to link what the student has learned to daily life A 3- Practicing different types of mathematical proofs A 4 - self-reliance in the achievement of mathematics B - The soft skills objectives of the course B1 - skills to apply calculus B2 - skill to find ends B3 - skill to draw functions

22. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2		Integer numbers and real numb intervals inequalities	1. Lecture, blackboard use a recitation 2. Demos 3. Interactive discussion 4. Self-learning	Formative Assessment/Tests Assignment of my hom Projects report Final Assessment / Midterm Exam Final exam
			Properties of of functions		
2	2		Domain and rang		
3	2		Graph of functions		
4	2		Limits Limits		
5	2		Continuous of functions		
6	2				
7	2		Special functions Derivatives		
8	2		Derivatives of Special functions		
9	2		Mathematical models		
10	2		Lines		
			Parametric equations		
			Parametric equations		
			Preparatory week bef the final Exam		

23. Course Evaluation

Formative Assessment
Tests / 2 hours. Weighing 10% (10), 5 weeks and 10
Assignments/Hours 2.Weighing 10% (10), Week 2 and 12
Projects/1hr, 10% (10), Continuous
Report/Hour 1 , Weight 10% (10),13 Week
Final Evaluation
Midterm Exam 2 hours 10,Weight % (10) 7,Week
Final Exam/2 hours, 50% weight (50), week16
Overall rating/100% (100 marks)

24. Learning and Teaching Resources

Required textbooks (curricular books, if any)	
Main references (sources)	Calculus, seven edition :Howard Anton, Irl Biv Stephen Davis. Calculus and Analytic Geometry by Thomas
Recommended books and references (scientific journals, reports…)	
Electronic References, Websites	Google scholar, wiki

Course Description Form

25. Course Name:

Mathematical 2

26. Course Code:

COS12110

27. Semester / Year:

2\2024

28. Description Preparation Date:

01\06\2023

29. Available Attendance Forms:

In attendance

30. Number of Credit Hours (Total) / Number of Units (Total)

30\4

31. Course administrator's name (mention all, if more than one name)

Name: Firas Abed Ahmed
Email: FirasAbedAhmed@uodiyala.edu.iq

32. Course Objectives

Course Objectives	This academic curriculum is a basic introduction to learning the basics of calculus, trigonometric, logarithmic and exponential functions. The student will learn methods of solution and application. The module aims to: 1- The objective required of the student in order to successfully pass the requirements of the course is to teach the student to make derivations for all mathematical functions, as well as the methods of drawing them. 2- The student's knowledge of distinguishing between functions and drawing them 3- Developing the student's ability to understand the concept of differentiation and its applications.

33. Teaching and Learning Strategies

Strategy	The main strategy that will be : A1- Students' ability to distinguish and cognitive perception (to diagnose general theories an principles in the study) A2-Future planning to link what the student has learned to daily life A 3- Practicing different types of mathematical proofs A 4 - self-reliance in the achievement of mathematics B - The soft skills objectives of the course B1 - skills to apply calculus B2 - skill to find the derivative

34. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1-5	10	tangent lines and calcula the derivative of some functions using definitio	Tangent and derivative lines, differentiation	In attendance a the use of exter sources of learr	Tests, assignments Projects/Laboratory. report

6-1(	10	Some forms of differentiation, base serie and differentiation of the power function. Increase functionality, reduce functionality and flood curves Implicit derivation and derivatives of higher powers Borders, some applicatio on borders Mean Value Theorem, Rolle's Theorem, L'Opital Rule Mean Value Theorem, Rolle's Theorem, L'Opital Rule Trigonometric functions together are fundamenta equivalent Inverse trigonometric functions with their differentiation Hyperbolic functions v their differentiation Inverse differentiation (integral)	rules, curves, and some applications of boundaries Trigonometric hyperbolic calculation addition to sc theorems	Teaching and learning metho 1. Lecture, blackboard use and recitation 2. Demos 3. Interactive discussion 4. Self-learning	Midterm Exam Final exam
11-1	10	Basic theory of integratic properties of integration Some application integrations Integration of trigonome functions, inverse trigonometric functions, hyperbolic functions Preparatory week bef the final exam	Integration and Some application		

35. Course Evaluation

Formative Assessment
Tests / 2 hours. Weight 10% (10). Week 5-10
Assignment of my house 2 hours. Weight 10% (10). Week 2-12
Projects / one hour. Weight 10% (10). continuous
Report / one hour. Weight 10% (10). Week 13
Introductory Assessment
The midterm exam is 2 hours, 10% (10). Week7
Final exam 2 hours .50% (50) .week 16.
100% overall rating (100 marks)

36. Learning and Teaching Resources

Required textbooks (curricular books, if ar	

Main references (sources)	Calculus, seven edition :Howard Anton, Irl Bivens, Step Davis. Calculus and Analytic Geometry by Thomas
Recommended books and references (scientific journals, reports…)	

37. Course Name:

Electronic References, Websites	Google scholar , wiki

Course Description Form

1. Course Name:
Mechanics and properties of matter
2. Course Code:
3. Semester / Year:
First and second semester 2023−2024
4. Description Preparation Date:
1/10/2023
5. Available Attendance Forms:
6. Number of Credit Hours (Total) / Number of Units (Total)
30 hours / 2 units
7. Course administrator's name (mention all, if more than one name)
Name: Prof .Dr Asaad Ahmed Kamil Email: prof.asaad@uodiyala.edu.iq
8. Course Objectives

Course Objectives	1. To develop skills in understanding physical quantaties and vectors 2. To understand the priciples of the Rectilinear motion and rotational motion . 3. Develop an understanding of the free falling bodies. 4. Getting to know the velocity ,acceleration and Newtons law of motion. 5. To understand the work and energy conservation for a body and to the system of particles. 6.To understand the simple harmonic motion vibration of a body **7**. To develop skills in understanding Density Elasticity, Mass density 8. To understand the priciples of the Stress- Strai Elastic Limit - Youngs Modulus 9. Develop an understanding of the Bulk Modulu Shear Modulus , Fluids 10. Getting to know the Pascal and Archimedes princ 5. To understand the Equation of continuity, Bernou equation 11.To understand the frictional in liquid , Visco ,surface Tension, Cohesive and adhesive propertie**.**

9. Teaching and Learning Strategies

Strategy	The main strategy that will be adopted is to present this unit in theoret lectures in mechanics and properties of matter from the professor of scientific subject, while encouraging students to participate in clarifying topics through discussion among students with the use of means of clarificat including posters in addition to scientific films, with a description of rec reports of scientists in this field.

10. Course Structure

Semest 1 Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Introduction to vecto Subtraction , Adding vectors	Principle of Mechanics	The blackboard the data show	Monthly and daily exams homework
2		Scalar and vector product .			
3		Motion , Average velocity and Displacement , Instantaneous velocity ,Acceleration			
4		Free Falling Bodies			
5		Motion with variable Acceleration .			
6		Motion In A Plane , Circular Motion			
7		Projectiles Motion			
8		Circular Motion with constant Angular Acceleration			
9		Force , First law of Newton's – Equilibrium			
10		Second and Third Newton's Law of Motion			
11		Mass and Weight , Friction			
12		Work done by constant forces -Energy - Kinetic Energy			
13		The work - Energy			

		Theorem – Power.			
14		Potential energy in one dimension ,			
15		Conservation of energy			
Semester 2					
1		Density and Elasticity, Mass density .			
2		Stress- Strain			
3		Elastic Limit - Youngs Modulus .			
4		Bulk Modulus –Shear Modulus			
5		Fluids			
6		Pressure - Atmospheric Pressure			
7		Pascal and Archimedes principle			
8		Equation of continuity			
9		Fluid flow			
10		Frictional force in liquid			
11		Viscosity			
12		Surface Tension			
13		Cohesive and adhesive propertie .			
14		Poiseuilles law			
15		Preparatory week before the final Exam			

11. Course Evaluation

Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	1- University physics by francis and othe 1982
Main references (sources)	1- Principle of physics by Jerry B. Marion and William F. Hornyak ,1984

Recommended books and references (scientific journals, reports…)	1-College Physics by Frederick J. Bueche and Euge Schaums Series. Ninth Edition, 1997 .
Electronic References, Websites	

Course Description Form

38. Course Name: sound and wave motion
39. Course Code:
40. Semester / Year: 2\2
41. Description Preparation Date: 29/3/2024
42.Available Attendance Forms: Classroom
43.Number of Credit Hours (Total) / Number of Units (Total): 30\2

44. Course administrator's name (mention all, if more than one name)

Name: Asst.Prof. Zena mohammed ali abbas
Email: zenaalban@yahoo.com

45. Course Objectives

Course Objectives	• The purpose of the course is to introduce students to study the fundamental the sound and wave motion

46. Teaching and Learning Strategies

Strategy	The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their ability to mathematical and real-life problem solving, the ability to use mathematics as a communication tool, the ability to connect mathematical ideas, the ability to reasoning that can be used in any situation, such as critical thinking, logical, and systematic; be objective, honest, discipline and solve problems. This will be achieved through classes, reports, projects and interactive tutorials.

47. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Basic Concepts Wave Motion	sound and wave motion	Attendance in classroom	Daily exams and homework, in addition to monthly exams
2	2	Means of energy transmission and types of wave motion	sound and wave motion	Attendance in classroom	Daily exams and homework, in addition to monthly exams

3	2	Sound waves	sound and wave motion	Attendance in classroom	Daily exams and homework, in addition to monthly exams
4	2	Types and features of sound	sound and wave motion	Attendance in classroom	Daily exams and homework, in addition to monthly exams
5	2	wave properties of sound	sound and wave motion	Attendance in classroom	Daily exams and homework, in addition to monthly exams
6	2	the first exam	sound and wave motion	Attendance in classroom	Daily exams and homework, in addition to monthly exams
7	2	The basic factors for the generation and propagation of sound waves	sound and wave motion	Attendance in classroom	Daily exams and homework, in addition to monthly exams
8	2	simple harmonic motion	sound and wave motion		
9	2	Finding a solution to simple harmonic equations	sound and wave motion	Attendance in classroom	Daily exams and homework, in addition to monthly exams
10	2	Calculation of the total energy of a simple harmonic oscillator	sound and wave motion	Attendance in classroom	Daily exams and homework, in addition to monthly exams
11	2	helical pulsator	sound and wave motion	Attendance in classroom	Daily exams and homework, in addition to monthly exams
12	2	simple pendulum	sound and wave motion	Attendance in classroom	Daily exams and homework, in

					addition to monthly exams
13	2	floating body	sound and wave motion	Attendance in classroom	Daily exams and homework, in addition to monthly exams
14	2	Forced frequency, resonance and decay	sound and wave motion	Attendance in classroom	Daily exams and homework, in addition to monthly exams
15	2	second exam	sound and wave motion	Attendance in classroom	Daily exams and homework, in addition to monthly exams

48. Course Evaluation

Quizzes	2	10% (10)
Assignments	2	10% (10)
Project	1	10% (10)
Report	1	10% (10)
Midterm Exam		10% (10)
Final Exam		50% (50)

49. Learning and Teaching Resources

Main references (sources)	Sound and Wave Motion book / written by Dr. Amjad Abdul Razzaq Karjieh
Electronic References, Websites	https://www.britannica.com/science/wave-motion

Course Description Form

1. Course Name:

Physics Thermodynamic 1

2. Course Code:

3. Semester / Year:

First and second semester/ 2023-2024

4. Description Preparation Date:

1-10-2023

5. Available Attendance Forms:

6. Number of Credit Hours (Total) / Number of Units (Total):

30 hours / 2 units

7. Course administrator's name (mention all, if more than one name):

Name: Assist. Prof. Dr. Jasim Mohammed Mansoor Alzangnawee

Email: Alzanganawee@uodyaila.edu.iq

8. Course Objectives:

Course Objectives	the first semester contains an introduction to equilibrium thermodynamics. The First and Second laws of thermodynamic 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 entrop complete this section.

9. Teaching and Learning Strategies:

Strategy	The main strategy that will be adopted in delivering this module is to encourage studer participation in the exercises, while at the same time refining and expanding their ability thermodynamic and real-life problem solving, the ability to use mathematics as communication tool, the ability to connect physics thermodynamic ideas, the ability reasoning that can be used in any situation, such as critical thinking, logical, and systema be objective, honest, discipline and solve problems. This will be achieved through class reports, projects and interactive tutorials.

10. Course Structure:

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	**Definitions and basic fundamentals**	Physics thermodynamic 1	The blackboard and the data show	Monthly and daily exams and homework
2	2	Zeroths law of thermodynamic and the thermal equilibrium	Physics thermodynamic		

3	2	Temperature and its scales			
4	2	Heat and heat capacity			
5	2	Specific heat capacity			
6	2	First exam			
7	2	Difference between Cp and Cv			
8	2	Heat transfer (Conduction, Convection, Radiation) part1			
9	2	Heat transfer (Conduction, Convection, Radiation) part 2			
10	2	Thermodynamic Processes			
11	2	Derivation of Work law			
12	2	Derivation of Work law			
13	2	Work calculation in different thermodynamic processes			
14					

	2	First law of thermodynamic			
15	2	Second exam			
2nd course			Statistical thermodynamic		
16	2	Ideal gas and derivation law			
17	2	Second law of thermodynamic			
18	2	Thermal engine			
19	2	Carnot cycle of thermal engine			
20	2	Refrigeration Cycle			
21	2	First exam			
22	2	The Entropy and second law of thermodynamic			
23	2	Third law of thermodynamic			
24	2	Maxwell equations of thermodynamic			
25					

26 27 28 29 30	2 2 2 2 2 2 2	Statistical thermodynamics Maxwell Boltzmann distribution law Bose Einstein distribution law Bose Einstein distribution law The relation and difference between Maxwell, Bose einsten and fermi dirac distributions Second exam			

11. Course Evaluation:

Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc

12. Learning and Teaching Resources:

Required textbooks (curricular books, if any)	Fundamentals of Thermodynamics Edition Claus Borgnakke (Author), Richard Sonntag (Author)
Main references (sources)	Introduction in Electromagnetic Theory
Recommended books and references (scientific journals, reports…)	Understanding Thermodynamics (Do Books on Physics) Later Printing Edition by H. C. Van Ness
Electronic References, Websites	

Course Description Form

50. Course Name: ANALYTIAL MECHANICS	
51. Course Code:	
52. Semester / Year: 1/2	
53. Description Preparation Date: 29/3/2024	
54.Available Attendance Forms: Classroom	
55.Number of Credit Hours (Total) / Number of Units (Total): 150 / 6	
56. Course administrator's name (mention all, if more than one name)	
Name: Prof. FIRAS MAHMOOD HADY Email: firas_1962@yahoo.com	
57. Course Objectives	
Course Objectives	The purpose of the course is to introduce students to methods of analytical mechanics and develop the mathematical skills required to solve problems in analytical mechanics, kinetic dynamics, and other areas of theoretical physics. • Understanding and absorbing important theoretical mathematical derivations to explain various mechanical kinetic phenomena •
58. Teaching and Learning Strategies	

Strategy	The main strategy that will be adopted in delivering this course is to encourage students' participation in exercises, and at the same time improve and expand their ability to solve mathematical and realistic problems related to general and analytical mechanics, the ability to use mathematics as a communication tool, the ability to connect physical and mathematical ideas, and the ability to Reasoning that can be used in any situation, such as critical, logical, and systematic thinking; Be objective, honest, disciplined and problem solver. This will be achieved through interactive assignments, reports, projects and tutorials.

59. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Introducing the student to vector analysis and its importance, and the basics of vector concepts	Introduction to vectors, their analysis, and their importance in physics	Presence	Daily exams and homework, in addition to monthly exams
2	2	The student introduces the units of a vector, its magnitude, numerical multiplication and cross multiplication	Basics of vector concepts	Presence	Daily exams and homework, in addition to monthly exams

		of vectors, their properties and uses			
3	2	Introducing the student to vector calculus, its properties and uses	Basics of vector concepts, particle kinematics, and vector calculus	Presence	Daily exams and homework, in addition to monthly exams
4	2	The student introduces the properties of vector differentiation and integration, the tangential and perpendicular components of acceleration and their uses, and the velocity and acceleration of particles in polar, cylindrical and spherical coordinates.	The student introduces the properties of vector differentiation and integration, the tangential and perpendicular components of acceleration and their uses, and the velocity and acceleration of particles in polar, cylindrical and spherical coordinates.	Presence	Daily exams and homework, in addition to monthly exams

5	2	Newton's three laws of motion, mass, force, and linear and angular momentum in motion along a straight line	Kinetics of particles moving in a straight line	Presence	Daily exams and homework, in addition to monthly exams
6	2	Introducing the student to how to find potential energy, kinetic energy of particles, and force as a function of speed, position, and time separately, and the conditions for conservation of force	Finding potential and kinetic energy, the law of conservation of energy, and the conditions for conservation of force	Presence	Daily exams and homework, in addition to monthly exams
7	2	Introducing the student to vertical motion in a resistant	Understanding and comprehending the derivations of the	Presence	Daily exams and homework, in

		medium, the ultimate speed, and the change of gravity with height	movement of a body in a resistive medium and finding the ultimate velocity and the change of gravity with height		addition to monthly exams
8	2	Mid-term exam		Presence	Daily exams and homework, in addition to monthly exams
9	2	Linear impeding force, harmonic motion and their applications	Physical applications of simple harmonic motion	Presence	Daily exams and homework, in addition to monthly exams
10	2	Introducing the student to particle	General mobility, job creation, areas of	Presence	Daily exams and

		kinetics in general motion, the principle of work, conservative forces, and force fields	strength and conservative power		homework, in addition to monthly exams
11	2	Introducing the student to the potential energy function and the concepts of gradient, divergence, and convolution of vectors and their various applications in physics	Find the potential energy function of the particle and the gradient, divergence, and convolution of the vectors	Presence	Daily exams and homework, in addition to monthly exams
12	2	Introducing the student to the movement of projectiles in a uniform gravitational field and various solved problems	Equations of motion of projectiles in a uniform gravitational field	Presence	Daily exams and homework, in addition to monthly exams
13	2	Student's definition	Derivations of	Presence	Daily exams

		of harmonic oscillator in two and three dimensions	motion in a harmonic oscillator in two and three dimensions		and homework, in addition to monthly exams
14	2	Introducing the student to the restricted motion of a particle and the energy equation in a smooth neutral	Constrained particle motion and derivation of energy calculation in a smooth neutralizer	Presence	Daily exams and homework, in addition to monthly exams
15	2	Introducing the student to movement along a curve, the simple pendulum, and various solved problems	Motion on a curve and a simple pendulum	Presence	Daily exams and homework, in addition to monthly exams

60. Course Evaluation

Quizzes	2	10% (10)
Assignments	2	10% (10)
Project	1	10% (10)
Report	1	10% (10)
Midterm Exam		10% (10)
Final Exam		50% (50)

61. Learning and Teaching Resources

Required textbooks (curricular books, if any)	. ANALYTICAL MECHANICS by GRANT R.FOWLES , 2nd.edition , 1970

Main references (sources)	Classical Mechanics , by H.GOLDSTEIN, Addision Wesley 1974
Recommended books and references (scientific journals, reports…)	THEORETICAL MECHANICS by M.R.SPIEG McGraw-Hill Schaum , s Outline Series 1967
Electronic References, Websites	http://ocw.mit.edu/courses/analytical mechanics/

Course Description Form

62. Course Name:
Physical optics
63. Course Code:
Core
64. Semester / Year:
Second semester /2023−2024
65. Description Preparation Date:
1/10/2023
66.Available Attendance Forms:
67.Number of Credit Hours (Total) / Number of Units (Total)
30 hours / 2 Units
68. Course administrator's name (mention all, if more than one name)
Name: Assist. Prof .Dr. Gailan Asad Kazem

Email: kilanasaad@uodiyala.edu.iq

69. Course Objectives

This course is to familiarize the student with physical optics concept. Phenomena, modeling and its application to modern optical systems that incorporate different tools and/or elements such as gratings, prism, and polarizer. The course provides students with a working knowledge of optical physics, including wave nature of light to describe different optical phenomenon like interference, diffraction, polarization, scattering, Radiometry, spectroscopy, photonics and atomic physics. It also provides a basis for further study in optics and photonics.

At the conclusion of this class, the student will be able to:

- To develop problem solving skills and understanding of optical elements and systems in a physical optics.
- To understand optical system and how it works.
- To understand the basic subject for most the optics concept and Phenomena.
- To understand how can setting the optical system and how can analyses the results.

70. Teaching and Learning Strategies

Strategy	The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinl skills. This will be achieved through classes, interactive tutorials and by considering types of simple experiments involving some sampling activities that are interesting to the students.

71. Course Structure

Semester-1		Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
Week	Hour				
1	2	Wave Theory of Light: nature of Light, Coherent and incoherent light sources.	Physical Optics 1 and 2	Data show, Smart Screen and blackboard	Homework , Monthly and/or daily exam
2	2	Wave Equation, Leaner Wave equation, Plane Waves, Spherical Waves, Harmonic Wave, Helmholtz wave equation and Electromagnetic Waves.			
3	2	Superposition Principles for two or more waves overlap in space.			
2	2	Superposition waves with the same frequency, two opposite direction waves,			
4	2	Superposition waves at right			

		angle.			
5	2	Phase velocity and group velocity			
6	2	Interference of Light, Constructive and Destructive Interference from Two Waves.			
7	2	Interference by division of wavefront including the Young's experiment (Double-Slit), and Fresnel biprism,.			
8	2	Interference due to division of amplitude. Optical elements such as beam splitters, mirror is used for achieving amplitude division. Michelson's interferometer.			
9	2	Measure the referective index wavelength by interference			
10	2	Other examples of Interference due to division of amplitude such as Tweeman & Green Iterferometer,			
11	2	Interference by reflection			
12	2	Interference in thin films (wedge shape and Newton's ring)			
13	2	Jamin Interferometer, Mach-Zehnder Interferometer			
14	2	Raylegh's interferometer and Applications of interference problem and solution			
15	2	Monthly exam			
Semester -2		**Required Learning**	**Unit or subjec**	**Learning method**	**Evaluation**
week	**hour**	**Outcomes**	**name**		**method**
1	2	Resolving power: description, meaning and application	Physical optics	Data show, Smart screen and blackboard	Homework , Monthly and/or daily exam
2	2	Antireflection coatings minimize the reflection of one or many wavelengths and are typically used on the surface..			
3	2	Coating techniques including drop casting, dip coating, optical deposition, electrospinning/electrospraying, and layer-by-layer deposition.			
4	2	Polarization **of** light**:** Jones Vector , Polarized light, degree of Polarization.			
5	2	Types of Polarization: Linear or plane polarization, Circular polarization and Elliptical polarization.			
6	2	Mathematical representant of			

		each type of polarization			
7	2	Methods to obtain light Polarization including absorption, reflection, and scattering.			
8	2	Diffraction of Light: Fraunhofer and Fresnel			
9	2	Fraunhofer Diffraction from a single slit,			
10	2	Fraunhofer Diffraction from a, Double slit, and diffraction grating			
11	2	Diffraction grating			
12	2	Fraunhofer Diffraction from circular and rectangular apertures.			
13	2	Intensities distribution by single and double slit.			
14	2	Fresnel Diffraction mathematical description and examples and Applications of Diffraction problem and solution			
15	2	Monthly exam			

72. Course Evaluation

Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc

73. Learning and Teaching Resources

Required textbooks (curricular books, if any)	1. Introduction to optics, by F. L. Pedrotti, 2nd edition 1993. 2. Optics by A.P. Konijnenberg, A.J.L. Adam, & H.P Urbach, . TU Delft, Second Edition 2022.
Main references (sources)	Fundamentals of Optics, by Francis Jenkins, & Harvey White, Fourth Edition 1957
Recommended books and references (scientific journals, reports…)	1- Advances in Atomic, Molecular, and Optical Physics, Susanne F. Yelin, Louis F. Dimauro, Helene Perrin, 2019 2- Fundamentals of Physics I Mechanics, Relativity, and Thermodynamics R. Shankar,2019. 3- Fundamentals of Photonics Bahaa E. A. Saleh, Malvin Carl Teich,2017. 4- Introduction to Modern Optics Grant R. Fowles, 2010. 5-Introduction to Modern Optics for Students Engineering and Applied Science Stephen Arnold, Kaitlynn Snyder, 2018.
Electronic References, Websites	https://www.classcentral.com/tag/optics?lang=english

Course Description Form

1. Course Name:	
Quantum Mechanics	
2. Course Code:	
3. Semester / Year:	
First and second semester 2023−2024	
4. Description Preparation Date:	
1/10/2023	
5. Available Attendance Forms:	
6. Number of Credit Hours (Total) / Number of Units (Total)	
60 hours / 2 units	
7. Course administrator's name (mention all, if more than one name)	
Name: Faisal Ghazi Hammoodi Email: faissal_hammody@uodiyala.edu.iq	
8. Course Objectives	
Course Objectives	1. To develop skills in understanding Foundation of quantum mechanics. 2. To understand the principles of the Theories of black body radiation . 3. Develop an understanding of the Schrodinger time dependent equation.. 4. Getting to know the photoelectric effect ,Requirement on wave function. 5. To understand the Requirement on wave function operators in quantum mechanics, Normalization function, Eigen function and Eigen value, Average or expectation value. 6.To understand the one-Dimensional simple harmonic oscillator classical mechanics , Generating

	function, the results of classical and quantum mechanics for simple harmonic oscillator.

9. Teaching and Learning Strategies

Strategy	The main strategy that will be adopted is to present this unit in theoretical lectu from the professor of the scientific subject, while encouraging students to particip in clarifying the topics through discussion among students with the use of means clarification, including posters in addition to scientific films, with a description recent reports of scientists in this field.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1. 2. 3. 4. 5. 6. 7.	2	Inadequacy of classical theory to explain the spectrum of black body radiation, Theories of black body radiation. photoelectric effect, The Compton Effect Bohrs Theory of Hydrogen atom,The Somerfield Relativistic atom model. Zeeman effect,Origin of normal Zeeman effect,origin of Anomalous Zeeman effect. solved Examples Schrodinger Equations, Introduction,Schrodinger time dependent equation and Schrodinger time independent equation Requirement on wave function, Probability current density equation of continuity and its physical significances operators in quantum	Quantum Mechanics	The blackboard the data show	Monthly and daily exams homework

8.		mechanics,Normalization function, Eigen function and Eigen value			
9.		Midterm exam			
10.		Average or expectation value,Variance ,Exchanging of average value per unit time,Degeneracy			
		Parity, solved Examples			
11.		Introduction,one-Dimensional simple harmonic oscillator classical mechanics			
12.					
13.		Normalization of wave function,Generating function			
14.		Comparison between the results of classical and quantum mechanics for simple harmonic oscillator			
		solved Examples			
15.					
Semester 2					
16.		Free particles:Particles in one dimension box,Free particles in potential box in three dimensions			
17.		The potential step, Reflection and transmission in potentials barrier.			
18.		one – Dimensional Rectangular Potential Barrier (Quantum Mechanical Tunnelling Effect),One-Dimensional Square Well Potential (Free States).			
19.		One-Dimensional Square Well Potential of Finite Depth:Bound State,Density			

		of states			
20.		solved Example			
21.		Particles in Spherically Symmetric Potentials(Spherical Harmonics), Schrodinger equation for a central potential, Solution of differential equation and The Hydrogen Atom.			
22.		The wave equation for the hydrogen atom, Reduction to Equivalent one-Body problem.			
23.		Separation of Variables Solution of the ϕ-equation			
24.		Midterm exam			
25.		Solution of the θ-equation, Solution of Radial equation			
26.		The Rigid Rotator, Solved Examples			
27.		Dirac Bra and Ket Notations, Properties of Bra and Ket Notations			
28.		Condition of Normalization , Orthogonality Condition, Eigenvalues and Eigenvector			
29.		Observable Operator , The Hermitian Adjoint			
30.		The Linear Harmonic Oscillator in Dirac Notation, Solved Examples Preparatory week before the final Exam			
11.Course Evaluation					

Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc	
12.Learning and Teaching Resources	
Required textbooks (curricular books, any)	1.Perspective of Quantum Mechanics by S.P.Kuila ,first edition 2008 2. Quantum Mechanics Concept and Application. Nouredine Zettili 2001.
Main references (sources)	
Recommended books and references (scientific journals, reports...)	1-1000 Solved problems in Modern physics Ahmed A.Kamal ,2010
Electronic References, Websites	

Course Description Form

Course Name: Geometrical Optics and Physical Optics	
13. Course Code: PHY-321 and PHY -322	
14. Semester / Year: 2023-2024	
15. Description Preparation Date: 6/12/2024	
16.Available Attendance Forms: In person	
17.Number of Credit Hours (Total) 2/Week/ Number of Units (Total) 3	
18. Course administrator's name (mention all, if more than one name)	
Name: Gailan A. Kazem AL-Dainy Email: Email: kilanasaad@uodiyala.edu.iq	
19. Course Objectives	
Course Objectives	This course is to familiarize the student with physical optics concept. Phenomena, modeling and its application to modern optical systems that incorporate different tools and/or elements such as gratir prism, and polarizer. The course provides students with a working knowledge of optical physics, including wave nature of light to describe different optical phenomenon like interference, diffractio polarization, scattering, Radiometry, spectroscopy, photonics and atomic physics. It also provides a basis for further study in optics and photonics.**:**

20.	Teaching and Learning Strategies
Strategy	A1. To understand optical system and how it works. A2. To understand the basic subject for most the optics concept and Phenomena. A3. To understand how can setting the optical system and how can analyses the results. A4. To develop problem solving skills and understanding of optical elements and systems in a physical optics. A5. To use tools, methodologies, language and conventions of physics to test and communicate ideas and explanations A6. Integrate several components of the course in the context of a new situation

10. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
Week 1	3	Introduction	Wave Theory of Light:	Theoretical	General questions and Discussion
Week 2	3	Nature of Light	Superposition of waves	Theoretical	General questions and Discussion
Week 3	3	Interference of Light,	Interference of Light		Discussion and oral test.
Week 4	3	Interference	Interference by division of wavefront	Theoretical	Monthly Eam and Discussion
Week 5	3	Interference	Interference due to division of amplitude	Theoretical	General questions and Discussion
Week 6	3	Interference	Examples of Interference	Theoretical	General questions and Discussion
Week 7	3	Interference	Application of Interference	Theoretical	Discussion and oral test.
Week 8	3	Thin films	Coating techniques	Theoretical	Monthly Eam and Discussion
Week 9	3	Polarization	Polarization of light	Theoretical	General questions and Discussion
Week 10	3	Polarization	Types of Polarization	Theoretical	General questions and Discussion
Week 11	3	Polarization	Methods to obtain light Polarization	Theoretical	Discussion and oral test.
Week 12	3	Diffraction	Diffraction of Light	Theoretical	Monthly Eam and Discussion
Week 13	3	Diffraction	Fraunhofer	Theoretical	General questions and

			Diffraction		Discussion
Week 14	3	Diffraction	Fresnel Diffraction	Theoretical	General questions and Discussion
Week 15	3	Diffraction	Application of Diffraction	Theoretical	Discussion and oral test.

21. Course Structure

22. Course Evaluation

Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc

23. Learning and Teaching Resources

Required textbooks (curricular books, if any)	**1- Advances in Atomic, Molecular, and Optical Physics. Susanne F. Yelin, Louis F. Dimauro, Helene Perrin, 2019.** **2- Fundamentals of Physics I Mechanics, Relativity, and Thermodynamics R. Shankar,2019.** **3- Fundamentals of Photonics Bahaa E. A. Saleh, Malvin Carl Teich,2017.** **4- Introduction to Modern Optics Grant R. Fowles, 2010.** **5- Introduction to Modern Optics for Students in Engineering and Applied Science Stephen Arnold, Kaitlynn Snyder, 2018.**
Main references (sources)	1. Introduction to optics, by F. L. Pedrotti, 2nd edition 1993. 2. Optics by A.P. Konijnenberg, A.J.L. Adam, & H.P. Urbach, TU Delft, Second Edition 2022. 3.Fundamentals of Optics, by Francis Jenkins, Harvey White, Fourth Edition 1957.
Recommended books and references (scientific journals, reports…)	Journal of Optics /Springer
Electronic References, Websites	https://www.classcentral.com/tag/optics?lang=english

Course Description Form

1. Course Name:
Electromagnetic Theory 1,2
2. Course Code:
3. Semester / Year:
First and second semester/ 2023-2024
4. Description Preparation Date:
1-10-2023
5. Available Attendance Forms:
6. Number of Credit Hours (Total) / Number of Units (Total):
30 hours / 2 units
7. Course administrator's name (mention all, if more than one name):
Name: Prof. Dr. Sabah A. Salman Email: **pro.dr_sabahanwer@yahoo.com**
8. Course Objectives:

Course Objectives	The purpose of the course is to introduce students to methods of electromagnetic theory physics and to develop required mathematical skills to solve problems in electromagnetic, electrodynamics and other fields of theoretical physics.
9. Teaching and Learning Strategies:	
Strategy	The main strategy that will be adopted in delivering this module is to encour students' participation in the exercises, while at the same time refining and expand their ability to electromagnetic and real-life problem solving, the ability to mathematics as a communication tool, the ability to connect electromagnetic ide the ability to reasoning that can be used in any situation, such as critical thinki

	logical, and systematic; be objective, honest, discipline and solve problems. This v be achieved through classes, reports, projects and interactive tutorials.

10. Course Structure:

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1(semester 1)	2	Vector analysis	Electromagnetic Theory	The blackboard and the data show	Monthly and daily exams and homework
2		Vector analysis			
3		Vector analysis			
4		Electrostatics			
5		Electrostatics			
6		Electrostatics			
7		The solution problem of electrostatics			
8		The solution problem of electrostatics			
9		The solution problem of electrostatics			
10		The solution problem of electrostatics			
11		Electrostatics field			
12		Electrostatics field			
13		Electrostatics field			
14		Electrostatics field			
15		First exam			
16		Electrostatics energy			

(semester 2)					
17		Electrostatics energy			
18		Electrostatics energy			
19		Electrostatics energy			
20		Electric current			
21		Electric current			
22		Electric current			
23		Electric current			
24		Electric current			
25		Maxwell's equation			
26		Maxwell's equation			
27		Application of Maxwell's equation			
28		Application of Maxwell's equation			
29		Application of Maxwell's equation			
30		Second exam			

11. Course Evaluation:

Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc

12. Learning and Teaching Resources:

Required textbooks (curricular books, if any)	Foundations of Electromagnetic Theory Reitz and Milford
Main references (sources)	Introduction in Electromagnetic Theory
Recommended books and references	Electromagnetic

(scientific journals, reports…)	
Electronic References, Websites	Various sites and topics ab electromagnetic theory, questions problems

Course Description Form

74. Course Name: Mathematical Physics	
75. Course Code: Phy-451	
76. Semester / Year: 1/4	
77. Description Preparation Date: 29/3/2024	
78.Available Attendance Forms: Classroom	
79.Number of Credit Hours (Total) / Number of Units (Total): 150 / 6	
80. Course administrator's name (mention all, if more than one name)	
Name: Prof. Dr. Nabeel Ali Bakr Email: nabeelalibakr@yahoo.com	
81. Course Objectives	
Course Objectives	• The purpose of the course is to introduce students to methods of mathematical physics and to develop required mathematical skills to solve problems in quantum mechanics, electrodynamics and other fields of theoretical physics. • To understand special functions, periodic functions, Fourier series analysis, and solution of partial differential equations.
82. Teaching and Learning Strategies	

Strategy	The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their ability to mathematical and real-life problem solving, the ability to use mathematics as a communication tool, the ability to connect mathematical ideas, the ability to reasoning that can be used in any situation, such as critical thinking, logical, and systematic; be objective, honest, discipline and solve problems. This will be achieved through classes, reports, projects and interactive tutorials.

83. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Introducing the student to special mathematical functions and their importance	Introduction to special functions and their importance in physics	Attendance in classroom	Daily exams and homework, in addition to monthly exams
2	2	Introducing the student to the gamma function, its properties and uses	Gamma function	Attendance in classroom	Daily exams and homework, in addition to monthly exams
3	2	Introducing the student to the beta function, its properties and uses	Beta function	Attendance in classroom	Daily exams and homework, in addition to monthly exams
4	2	Introducing the student to the error function and the Sterling approximation and their uses	Error function and Sterling approximation	Attendance in classroom	Daily exams and homework, in addition to monthly exams
5	2	Introducing the student to periodic functions and their importance in physics	Periodic functions	Attendance in classroom	Daily exams and homework, in addition to monthly exams
6	2	Introducing the student to how to find the rate of a	Find the average of a function over a given interval	Attendance in classroom	Daily exams and homework,

		function in a specific period			in addition to monthly exams
7	2	Introducing the student to Fourier series and its applications	Fourier analysis	Attendance in classroom	Daily exams and homework, in addition to monthly exams
8	2	Mid-Term Exam			
9	2	Problem solving training	Physical applications	Attendance in classroom	Daily exams and homework, in addition to monthly exams
10	2	Introducing the students to partial differential equations in physics	Partial differential equations in physics	Attendance in classroom	Daily exams and homework, in addition to monthly exams
11	2	Introducing the students to the method of separation of variables	Separation of variables method	Attendance in classroom	Daily exams and homework, in addition to monthly exams
12	2	Introducing the students to Fuche's theory and Frobenius method	Fuche's theory and Frobenius method	Attendance in classroom	Daily exams and homework, in addition to monthly exams
13	2	Introducing the students to Gender's differential equation	Gender's differential equation	Attendance in classroom	Daily exams and homework, in addition to monthly exams
14	2	Introducing the students to Hermite's differential equation	Hermite's differential equation	Attendance in classroom	Daily exams and homework, in addition to monthly

					exams
15	2	Introducing the students to Bessel's differential equation	Bessel's differential equation	Attendance in classroom	Daily exams and homework, in addition to monthly exams

84. Course Evaluation		
Quizzes	2	10% (10)
Assignments	2	10% (10)
Project	1	10% (10)
Report	1	10% (10)
Midterm Exam		10% (10)
Final Exam		50% (50)

85. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	Mathematical methods in the physical sciences by M. Boas.
Main references (sources)	1. Mathematical methods for physicists by G. Arfken. 2. Calculus Early Transcendentals by G. Thomas 3. Methods of Mathematical Physics by Harold Jeffreys & Bertha Swirles Jeffreys
Recommended books and references (scientific journals, reports…)	1. Methods of Mathematical Physics by R. Courant and D. Hilbert 2. Mathematical Physics by E. Butkov
Electronic References, Websites	http://ocw.mit.edu/courses/mathematics/

Course Description Form

86. Course Name:
Solar cell
87. Course Code:
Special Topic
88. Semester / Year:
Second semester /2024
89. Description Preparation Date:
31/12/2023
90.Available Attendance Forms:

91. Number of Credit Hours (Total) / Number of Units (Total)

30 hours / 2 Units

92. Course administrator's name (mention all, if more than one name)

Name: Assist. Prof .Dr. Gailan Asad Kazem
Email: kilanasaad@uodiyala.edu.iq

93. Course Objectives

Students will learn how solar cells convert light into electricity, how solar cells are manufactured, how solar cells are evaluated, what technologies are currently on the market, and how to evaluate the risk and potential of existing and emerging solar cell technologies. We examine the potential & drawbacks of currently manufactured technologies (single- and multi-crystalline silicon, CdTe, CIGS, CPV), as well as pre-commercial technologies (organics, biomimetic, organic / inorganic hybrid, and nanostructure-based solar cells). Hands-on laboratory sessions explore how a solar cell works in practice. We will learn how to enhance solar cell performance and reduce cost, and the major hurdles–technological, economic, and political–towards widespread adoption. Students will apply this knowledge towards developing a class project on the solar-related topic of their choosing.

At the conclusion of this class, the student will be able to:

- To develop a comprehensive technological understanding in solar PV system components
- To provide in-depth understanding of design parameters to help design and simulate the performance of a solar PV power plant
- To pertain knowledge about planning, project implementation and operation of solar PV power generation.
- To understand How do Solar PV Modules Work?
- To understand how the solar cells technology made in the lab and/or in the industrial.
- To understand the part of solar cells layers collected and designed.
- To understand the basic subject for most the solar cells concept and principal.

To understand how can solar cells system fabricated and how can make it with good performance through the theoretical concept.

94. Teaching and Learning Strategies

Strategy	The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinl skills. This will be achieved through classes, interactive tutorials and by considering types of simple experiments involving some sampling activities that are interesting to the students.

95. Course Structure

Semester-1		Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
Week	Hour				
1	2	The Physics of the Solar Cell: Photovoltaic (PV) materials and applications: including the intrinsic, p-type and n-type semiconductor materials and	Solar cell	Data show, Smart Screen and blackboard	Homework , Monthly and/or daily exam

		p-n junction concept and definition of basics electricity.			
2	2	PN -Junction Diode Electrostatics, Solar Cell Fundamentals, and Properties of Efficient Solar Cells			
3	2	Global solar PV deployment status, Review of solar radiation components, radiation on tilted surface.			
2	2	Define basic terminology, including solar radiation, solar irradiation, solar insolation, solar constant, air mass, solar altitude angle, solar azimuth angle, solar window, array tilt angle, array azimuth angle, and solar incidence angle			
4	2	Semiconductor equations, light absorption and charge generation, recombination.			
5	2	Analysis of p-n junctions, depletion approximation, solution of semiconductor equations in depletion approximation, derivation of ideal diode law, solar cell performance output parameters.			
6	2	Ideal efficiency limits, Practical sources of loss, equivalent circuit model, characterizing solar cell performance.			
7	2	First half of class: Improving efficiency by reducing optical losses: texturing, anti-reflection coatings, light trapping, photon recycling, concentrating PV (CPV) Second half of class: Improving efficiency by reducing optical losses.			
8	2	Improving efficiency by reducing electrical losses, Reducing recombination and resistance via doping profiles and top contact design.			
9	2	Overview of commercial technologies 2. Commercial Technologies 1, Crystalline Si (c-Si).			
10	2	Commercial Technologies 2, Thin film Si (amorphous and crystalline.			

11	2	Crystalline Silicon Fabrication Methods (polycrystalline silicon and single crystalline).			
12	2	Commercial Technologies of CdTe and CIGS solar cell Photovoltaic.			
13	2	Emerging Technologies: single-junction limit – multijunction cells and hot carriers, multiple exciton generation. organic PV (OPV) and perovskites next generations solar cell.			
14	2	Economics of PV; Environmental impact and benefit of PV: Life cycle analysis, energy pay back timing, resource extraction and limitations.			
15	2	Analysis of p-n junctions, depletion approximation, solution of semiconductor equations in depletion approximation, derivation of ideal diode law, solar cell performance output parameters.			

96. Course Evaluation

Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc

97. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Antonio Luque, Steven Hegedus Handbook of Photovoltaic Science and Engineering. ISBN:9780470014004, 2003
Main references (sources)	1-Yu, P., and M. Cardona. Fundamentals of Semiconductors: Physics and Materials Properties. ed. Springer, ISBN: 9783540413233, 2004. 2- Green, M. Silicon Solar Cells: Advanced Princi and Practice. Centre Photovoltaic Devices & Syste ISBN: 9780733409943, 1995. 3- Poortmans, J., and V. Arkhipov. Thin Film Sola Cells: Fabrication, Characterization and Applicatio 1st ed. Wiley-Blackwell, ISBN: 9780470091265, 2006. 4-Kittel, Charles. Introduction to Solid State Physic 8th ed. John Wiley & Sons, ISBN: 9780471415268 2004. 5-Schroder, D. Semiconductor Material and Device Characterization. 2nd ed. Wiley-Intercedence, ISB 9780471241393, 1998
Recommended books and references (scientific	1. Antonio Luque, Steven Hegedus Handbook of Photovoltaic Science and Engineering.

journals, reports…)	ISBN:9780470014004, 2003. 2. Winter C.J., Sizmann., Vant-Hull L.L. Solar Power Plants: Fundamentals, Technology R.L, Systems, Economics. Springer. ISBN: 3540188975. (1991). 3. Jordan P.G. Solar Energy Markets: An Analysis of the Global Solar Industry. Academic Press. ISBN: 0123977681. (2013). 4. Honsberg, C., and S. Bowden. Photovoltaics: Devices, Systems and Applications, 1999. 5. Wenham, S., M. Green, et al., eds. Applied Photovoltaics. 2nd ed. Routledge, ISBN: 9781844074013, 2006.
Electronic References, Websites	https://www.pveducation.org/pvcdrom/welcome-to-pvcdr

Course Description Form

1. Course Name:	
Nuclear Physics	
2. Course Code:	
3. Semester / Year:	
First and second semester 2023−2024	
4. Description Preparation Date:	
1/10/2023	
5. Available Attendance Forms:	
6. Number of Credit Hours (Total) / Number of Units (Total)	
60 hours / 2 units	
7. Course administrator's name (mention all, if more than one name)	
Name: Faisal Ghazi Hammoodi Email: faissal_hammody@uodiyala.edu.iq	
8. Course Objectives	
Course Objectives	1. To develop skills in understanding Basic Properties of the Nucleus. 2. To understand the properties of Nucleus. 3. Develop an understanding of the Binding Energy

	4. Getting to know the Stability of the Nucleus, Nuclear Force. 5. To derive Radioactivity Decay Law, Geiger – Nutal Law. 6.To understand the Nuclear Radiation, Theory Alpha – Decay**.....**

9. Teaching and Learning Strategies

Strategy	The main strategy that will be adopted is to present this unit in theoretical lectures fr the professor of the scientific subject, while encouraging students to participate clarifying the topics through discussion among students with the use of means clarification, including posters in addition to scientific films, with a description of rec reports of scientists in this field.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1. 2. 3. 4. 5. 6. 7. 8. 9. 10.	2	Basic properties of Nucleus,Definitions andNuclear Terminology Commonly Used Units Nuclear Physics, properties Nucleus Radius and Density of Nucleus, Charge of Nucle Mass of Nucleus solved Examples Binding Energy, Other Formu of Binding Energy Stability of the Nucle Nuclear Force Nuclear Models,sol Examples Introduction, Radioactiv Decay Law Successive Nucl Decay **first exam** Radioactive Equilibrium, Natural Radiation Series, U of Radiation	Nuclear Physics	The blackboard the data show	Monthly and daily exams homework

		CarbonDating solved Examples			
11.		Nuclear Radiation, Alpha Decay			
12.		Geiger – Nutal Law ,Alpha Particles Spectrum			
13.		Theory of Alpha – Decay, Selection Rules of Alpha – Decay			
14.		Second exam			
15.					
Semester 2					
16.		Beta Particles and Gamma Radiation Decays, Beta Decay, Neutrino Hypothesis			
17.		Selection Rules of Beta Decay, Gamma Decay			
18.		Selection Rules of Gamma Decay,Solved Examples			
19.		Introduction, Factors affecting nuclear reactions, Particle Incident Energy, Particle Incident Type			
20.		Reaction Mechanism, Direct Reaction Compound Nuclear Reaction, Conservation Laws			
21.		Energy Conservation Law Momentum Conservation Law وReaction Energy,			
22.		Threshold Energy, Solved Examples			
23.		Introduction,Theory of Nuclear Fission,Type of Nuclear Fission			
24.		Midterm exam			
25.		Characteristics of Nuclear Fission, Energy distribution of Fission Fragments,Basic Fusion Processes Requirements for control,Suggested Fusion Devices,Thermo Nuclear Weapons,Solved Examples			
26.					
27.		Fundamental particle ,Characteristic of the elementary particles,Leptons Grope ,			

28. 29. 30.		Mesons Grope and Baryons Grope,Proton and antiproton,Neutron and antineutron,Neutrino and anti-neutrino,Pi-mesons,Mesons theory of Nuclear Force,Basic Interaction Strange Particles,Conservation Laws,Solved Examples **Preparatory week before the final Exam**			

11.Course Evaluation	
Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc	
12.Learning and Teaching Resources	
Required textbooks (curricular books, any)	Element of Nuclear Physics,WALTER E.MMEYRHOF,1967 2.Nuclear Physics Concept and Application,Bath Abed Al-Manem Abriheem,Faisal Ghazi Hammoodi,F Abed
Main references (sources)	1- Nuclear Physics ,Munib Adel Khalil,1996
Recommended books and references (scientific journals, reports...)	Nuclear Physics References
Electronic References, Websites	