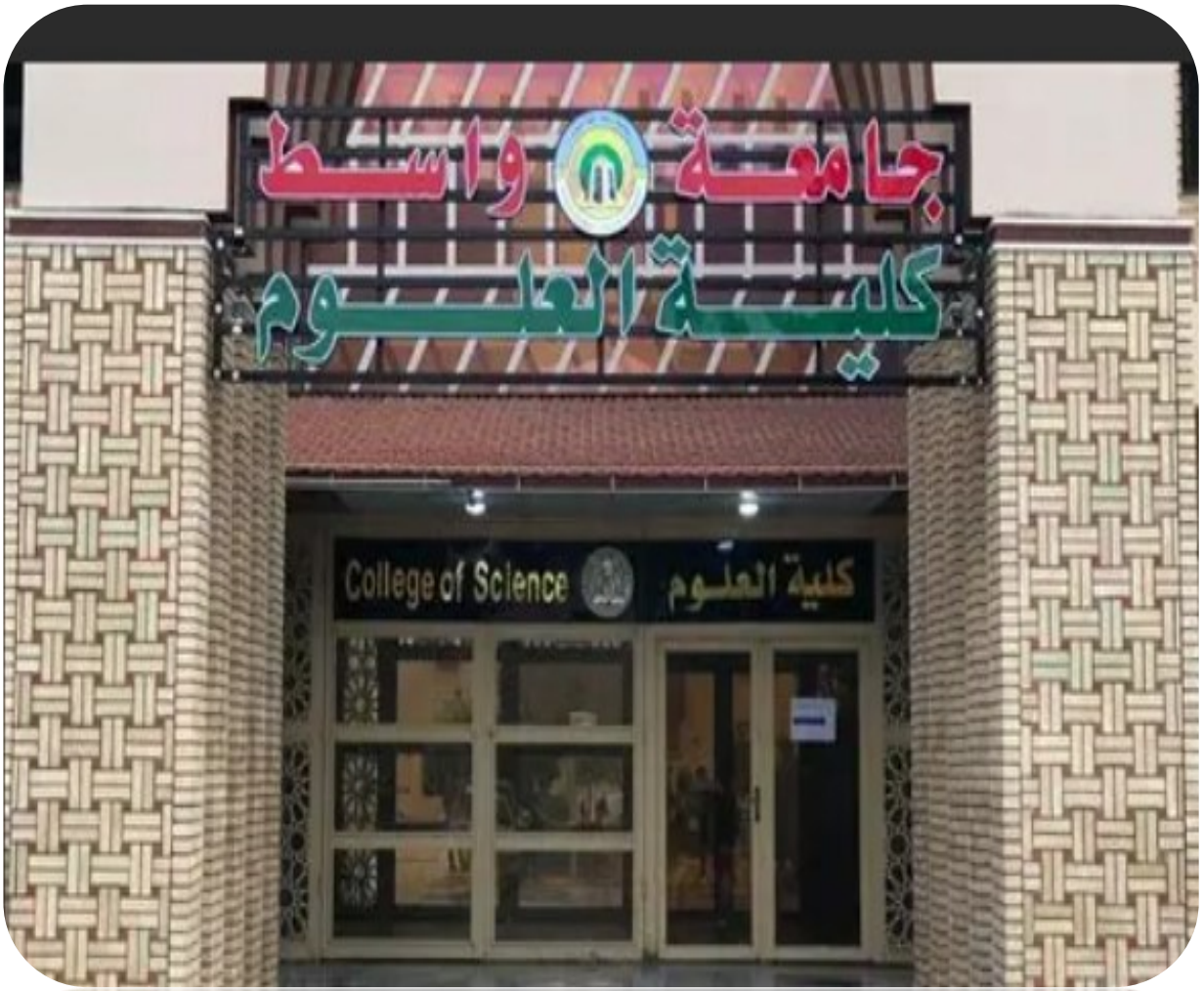
Republic of Iraq

Ministry of Higher Education and Scientific Research

University of Wasit

College of Science – Physics Department



2025-2026

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

2025-2026

Academic Program Description Form

University name/Wasit University

College/Institute/ College of Science

Scientific Department/ Department of Physics

Name of the academic or professional program/

Bachelor's degree in Physics

Name of Final degree/ Bachelor of Science in Physics

Academic system:/ Semester

Description Preparation Date:25/9/2025

File Completion Date: 1 / 2 / 2026

Signature:

Head of Department Name:

Dr. Najwa Jassim Jubier

Date: 1 / 2 / 2026

Signature:

Scientific Associate Name:

Dr. Faiq Jameel Hassan

Date: 15 / 2 / 2026

The File is checked by:

Department of Quality Assurance and University Performance

Director of the Quality Assurance and University Performance Department:

Date/

Signature/

م.م دنيا فاضل عباس
مسؤول شعبة ضمان الجودة والاداء الجامعي

Approval of the Dean

Introduction

Wasit University was established in 2003 and includes a wide range of scientific and humanities colleges. Among these, the College of Science is considered one of the core colleges, playing a significant role in preparing scientifically qualified and research-oriented graduates capable of meeting the requirements of the labor market and keeping pace with modern scientific developments.

The College of Science is affiliated with the Ministry of Higher Education and Scientific Research in Iraq and comprises several scientific departments, including Physics, Chemistry, Biology, and Mathematics, in addition to other interdisciplinary fields that support scientific integration and enhance research activities.

The semester system is one of the academic frameworks adopted in universities, aiming to organize the educational process by dividing the academic year into defined semesters. This contributes to a balanced distribution of courses, improves the quality of education, and enables better monitoring of students' academic progress. It also enhances effective learning and supports the gradual acquisition of knowledge and skills.

Within this context, the course description serves as a fundamental tool for organizing the teaching and learning process. It defines the course objectives, intended learning outcomes, course content, teaching and learning strategies, as well as assessment methods. It also emphasizes student-centered learning and the development of analytical thinking and scientific research skills, ensuring that students acquire the necessary knowledge and competencies to keep pace with scientific and professional advancements.

This description aims to provide a clear and well-structured framework for the course in line with quality assurance standards. It promotes the integration of theoretical knowledge with practical applications and contributes to enhancing students' academic and practical competencies.

Academic Program Description

The Bachelor of Science in Physics Program (General Physics and Medical Physics) provides a concise overview of the program's vision, mission, and objectives. It includes a clear and comprehensive specification of the intended learning outcomes, aligned with well-defined teaching and learning strategies. The program is designed to equip students with fundamental and applied knowledge in physics, develop their analytical and research skills, and prepare them to meet labor market requirements and pursue postgraduate studies.

Course Description

The course description provides a concise summary of the key features of each course, including its content, structure, and expected learning outcomes. It demonstrates the extent to which students achieve the intended learning outcomes and benefit from available learning opportunities. Each course is derived from and aligned with the overall Academic Program Description to ensure coherence and consistency within the program.

1. **Program Vision**
To be a distinguished and innovative academic program in physics education, providing high-quality learning in both General Physics and Medical Physics, and preparing competent graduates capable of excellence in scientific research, healthcare, and industrial fields, while contributing to sustainable development and meeting the evolving needs of society and the labor market

2. **Program Mission**
To provide high-quality education in physics by equipping students with strong theoretical foundations and practical skills in both General Physics and Medical Physics tracks. The program aims to prepare competent graduates capable of applying physics principles in scientific, industrial, and medical fields, engaging in research activities, and responding to the needs of the labor market and society

3. **Program Objectives**
1. To prepare graduates with a solid foundation in fundamental and applied physics in both General Physics and Medical Physics. 2. To develop students' analytical, critical thinking, and problem-solving skills. 3. To equip students with practical laboratory skills and the ability to use modern scientific and medical technologies. 4. To prepare graduates for employment in education, industry, healthcare, and research institutions. 5. To promote scientific research and encourage student participation in research activities. 6. To develop communication, teamwork, and professional skills. 7. To instill ethical and professional values, especially in medical applications of physics. 8. To prepare graduates for postgraduate studies in various fields of physics. 9. To align the program with labor market needs through continuous curriculum development.

10. To contribute to community service through applications of physics in energy, environment, and healthcare sectors

4. Program Accreditation

Is there a sponsor for the program?

No

5. Other external influences

Several external factors influence the Physics Academic Program's development and continuous improvement, including labor market requirements that guide curriculum updates, scientific and technological advancements, and integration of modern teaching methods, and frequent academic interruptions that may impact schedule continuity and course completion.

6. Program Structure

Program Structure	Number of Courses	Credit hours	Percentage	Reviews*
Institution Requirements	–	–	–	–
College Requirements	–	–	–	–
Department Requirements	**15** **14**	**38 for General Physcis** **42 for Medical Physcis**	–	**Basic &** **Elective**
Summer Training	–	–	–	–
Other				

Curriculum Structure

The curriculum structure of the Bachelor of Science in Physics Program (General Physics and Medical Physics tracks) includes all courses offered within the academic program in accordance with the adopted semester system. The curriculum is designed to ensure a balanced integration of theoretical knowledge and practical skills, distributed across different semesters and academic stages.

The program consists of various categories of courses, including university requirements, college requirements, and department (major) requirements, in addition to elective courses. Each course is assigned a specific number of credit hours, reflecting the contact hours and academic workload required for successful completion.

The curriculum is carefully organized to support the progressive development of students' knowledge, skills, and competencies across successive semesters. It ensures alignment with the program's learning outcomes and the needs of the labor market. The program also provides flexibility through elective courses and specialization tracks (General Physics and Medical Physics), which begin in the third academic year.

General Physcis

7. Program Description/ General Physcis							
Year/Level	Course Code	Course Name	اسم المادة الدراسية	Credit Hours		No. of Unit	Module Type
				theoretical	practical		
Fourth Stage/ First Courses	PHY-411	Nuclaear Physics I	فيزياء نووية I	2	2	3	C
	PHY-412	Solid State Physics I	فيزياء الحالة الصلبة I	2	2	3	C
	PHY-413	Electromagnatics Theory I	النظرية الكهرومغناطيسية I	2		2	C
	PHY-417	Optional III (Radiation Physics)	اختياري III (الفيزياء الاشعاعية)	2		2	E
	PHY-414	Nano-science	علم النانو	2		2	C
	PHY-415	Mathematical Physics I	الفيزياء الرياضية I	2		2	C
	PHY-416	Research project	مشروع بحث	2		2	C
		Total		16	4	16	

Fourth Stage/ Second Courses	PHY-421	Nuclaear Physics II	فيزياء نووية II	2	2	3	C
	PHY-422	Solid State Physics II	فيزياء الحالة الصلبة II	2	2	3	C
	PHY-423	Electromagnatics Theory II	النظرية الكهرومغناطيسية II	2		2	C
	PHY-424	Plasma physics	فيزياء البلازما	2		2	C
	PHY-425	Research project	مشروع بحث	2		2	C
	PHY-428	Biophysics	فيزياء حياتية	2		2	C
	PHY-426	Mathematical Physics II	الفيزياء الرياضيةII	2		2	C
	PHY-427	Optional IV Health Physics	اختياري IV (الفيزياء الصحية)	2		2	E
		Total		16	4	18	

Medical Physcis

7. Program Description/ _Medical Physcis							
Year/Level	Course Code	Course Name	اسم المادة الدراسية	Credit Hours		No. of Unit	Module Type
				theoretical	practical		
Fourth Stage/ First Courses	PHY-411	Medical Instrumentation I	الأجهزة الطبيةI	2	2	3	C
	PHY-412	Radiation Biology	بايولوجيا الاشعاع	2		2	C
	PHY-413	Physics of Nuclear Medicine	فيزياء الطب امنووي	2	2	3	C
	PHY-414	Physics of Radiotherapy	فيزياء الاضعة العلاجية	2	2	3	C
	PHY-415	Optional III (Mathematical Methods for Medical Physics)	اختياري(الطرق الرياضية للفيزياء الطبية)	2		2	E
	PHY-416	Research project	مشروع بحث	2		2	C
		Total		12	6	15	
Fourth Stage/ Second Courses	PHY-421	Medical Instrumentation II	الأجهزة الطبيةII	2	2	3	C
	PHY-422	Image processing	معالجة الصور	2	2	3	C
	PHY-423	Health Physics	الفيزياء الصحية	2		2	C
	PHY-424	Biophysics	الفيزياء الحياتية	2		2	C
	PHY-425	Electromagnetic Theory	النظرية الكهرومغناطيسية	2		2	C
	PHY-426	Optional IV (Bio statistics)	اختياري IV (إحصاء طبي)	2		2	E
	PHY-428	Nanoscience in Medicine	علم النانو الطبي	2		2	C
	PHY-429	Research project	مشروع بحث	2		2	C
		Total		16	4	18	

8- Learning Outcomes

Cognitive Objectives	
1. To provide students with the fundamental concepts and scientific theories across various branches of physics.	**2. To familiarize students with physical laws and their related scientific applications.**
3. To enable students to understand the mathematical and experimental methods used in physical sciences.	**4. To introduce students to recent developments in physics and their applications in technology, energy, medicine, and the environment.**
Skills Objectives	
1. To develop students' ability to analyze physical phenomena and solve scientific problems.	**2. To train students to use modern laboratory instruments and equipment efficiently and accurately.**
3. To enhance skills in conducting scientific experiments, collecting data, analyzing results, and writing reports.	**4. To enable students to use computers and scientific software in various physical applications.**
Ethics	
1.To strengthen commitment to professional ethics and academic integrity in scientific work	**2.To foster teamwork, collaboration, and responsibility**
3. To instill principles of laboratory safety and environmental awareness during experimental work.	**4.To promote respect for human values, human rights, and community service**
General Skills	
1. Develop effective communication, scientific presentation, and report-writing skills.	**2.Enhance self-learning abilities, continuous professional development, and keeping up with scientific advancements**.
3.Strengthen time management, work organization, and decision-making skills.	**4.Prepare students for employment in educational, research, technical fields, and the labor market**.

9- Teaching and Learning Strategies

The teaching and learning strategies adopted in this course aim to enhance students' understanding and achieve the intended learning outcomes through a variety of methods, including:

1. Lectures to present fundamental concepts and theoretical knowledge.
2. Interactive discussions to encourage student participation and critical thinking.
3. Laboratory work to develop practical skills and apply theoretical knowledge.
4. Problem-solving sessions to improve analytical and scientific thinking.
5. Assignments and projects to enhance independent learning and research skills.
6. Group work to promote teamwork and communication skills.
7. Seminars (student presentations) to develop presentation, discussion, and research skills.
8. Quizzes to assess students' understanding and provide continuous feedback.
9. Use of modern technologies such as simulations, e-learning platforms, and multimedia

tools.
10. Self-directed learning encourages students to take responsibility for their own learning.

10.Evaluation Methods

Implemented at all stages of the program in general.

1. Exams.
2. Writing scientific reports and research and presenting them.
3. Scientific discussions.
4. Attendance and daily activities.
5. Daily tests.

11. Faculty

The academic program is supported by a qualified and experienced team of faculty members who are committed to delivering high-quality education and fostering a productive learning environment. The teaching staff possesses diverse academic backgrounds and specializations that align with the program's objectives and curriculum requirements. They are actively engaged in teaching, research, and academic supervision, contributing to the development of students' knowledge, skills, and critical thinking abilities. In addition, faculty members participate in continuous professional development activities to ensure the adoption of modern teaching methodologies and the maintenance of academic standards in accordance with institutional and accreditation requirements.

11. Faculty

Faculty Members

No.	Academic Rank	Specialization		Special Requirements/ (if applicable)		Number of the teaching s	
		General	Special			Staff	Lecturer
1-	Prof.Dr. Abbas Fadhel Essa Jassim	**Physcis**	**MaterialsPhyscis**			✓	
2-	Prof. Dr. Ahmed Khader Abbas Mahdi	**Physcis**	**Plasm Physcis**			✓	
3-	Prof.Dr. Hadi Dweij Zarzour Mashial	**Physcis**	**Nuclear Physcics**			✓	

4-	Prof.Dr. Muneer Hlail Jaduaa Abdalla	**Physcis**	**Semiconductor Physcis**			✓	
5-	Prof. Dr. Hashem Ali Yasser Thuwainee	**Physcis**	**Materials Physics**			✓	
6-	Prof,Dr,Najwa Jassim Jubier Abbas	**Physcis**	**Materials Physics**			✓	
7-	Mohammed Juber Resen Aldhuhaibat	**Physcis**	**Nuclear Physcics**			✓	
8-	Asst. Prof. Dr. Mutasim Abrahim Malik Ali	**Physcis**	**Remote sensing and image processing**			✓	
9-	Asst.Prof.Dr. Ali Kamel Mohsin Nasir	**Physcis**	**Laser applications**			✓	
10-	Asst.Prof.Dr. Khudhair Abbas Assaf Ajeel	**Physcis**	**Astrophysics/ Astonomical spectrum Measurements**			✓	
11-	Asst. Prof. Dr Mahdi Ahmed Mohammed Mahdi	**Physcis**	**Nanophysics**			✓	
12-	Asst.Prof.Dr Faik Jamil Hassan Hameed	**Mathematics**	**Mathematical analysis**			✓	
13-	Asst.Prof.Dr. Hanan Abd Ali Thjeel khalfa	**Physcis**	**Laser and Electro-Optics**			✓	
14-	Asst. Prof. Dr. Ahmed Jaddah Farhan Dhahab	**Physcis**	**Materials Physics**			✓	
15-	Asst. Prof. Dr. Muhannad Ali Hussein Zughair	**Physics**	**Electronics**			✓	
16-	Asst. Prof. Dr. Ghada Ayad Kadhim abod	**Physcis**	**/Thin Films**			✓	
17-	Asst Prof.Dr. Maitham Salman Amana Salem	**Physcis**	**Environmental Studies \Fhysical Branch**			✓	
18-	Asst. Prof. Dr. Ali Jabbar Freih Obaid	**Physcis**	**Materials Physics**			✓	
19-	Asst. Prof. Dr. Saba Farhan Hathot Jasim	**Material Science**	**Material Technologies**			✓	
20-	Asst.Prof.Dr .Waleed kamil abdulkadhim Abdullah	**Applied Physics**	**Nanotechnology**			✓	
21-	Asst.Prof.Dr. Firas mohamed Dashoor Sabut	**Physcis**	**Nanotechnology**			✓	
22-	Asst.Prof.Dr.Oday Jawad Kadhim Hadhood	**Physcis**	**Nanotechnology**			✓	
23-	Asst . Prof. Dr. Nadia Naeema Dhahir Thathaa	**Physcis**	**Materials Physics**			✓	
24-	Asst.Prof.Dr. Najlaa Jerjack Abdullah Karmash	**Physcis**	**Materials Physics**			✓	
25-	Asst.Prof.Dr. Manal Jabbar Khalifa Alali	**Physcis**	**Optoelectronics**			✓	
26-	Lec.Dr. Eidan Asi Abdullah Aifan	**Physcis**	**Laser and Electro-Optics**			✓	
27-	Lec.Dr. Zeina Abbas Salman Waheed	**Physcis**	**Biophysics**			✓	
28-	Lec .Dr. Sattar Hussein Suwailem Ghadhib	**Physcis**	**Laser and Optics**			✓	

29	Lec .Dr. Muhannad Abdulkareem Saadoun	**Atmospheric science**	**Renewable energy**			✓	
30	Lec DrAhmed Abdul Mahdi Abdul Karim Jasim	**Electrical Engineering**	**computer control**			✓	
31	Lec .Dr. Ali Karim Aboud Mohammed	**Physcis**	**Materials Physics**			✓	
32	Lec .Dr. Shaimaa Hussien Shahad Hamza	**Physcis**	**Remote sensing**			✓	
33	Lec .Dr. Hassnein Farman Aboud Lafta	**Psychology**	**Educational Psychology**			✓	
34	Lec .Dr. Hassanein Rahim Abd Matrood	**Physcis**	**Nanotechnology**			✓	
35	Lec .Dr.Shaymaa Saadoon Hashim Hmood	**Physcis**	**Materials Physics**			✓	
36	Lec .Wasan Ali Hussein Hassan	**Physcis**	**Theoretical and Molecular Physics**			✓	
37	Lec .Dr.Ahmed Abdulkadhim Thamer Khaji	**Physcis**	**NanoMaterials**			✓	
38	Lec .Dr. Zaynab Ali Harbi Awfi	**Physcis**	**Thin Films**			✓	
39	Lec .Dr.Haider Majid Tuma Hassoon	**Physcis**	**Remote sensing**			✓	
40	Lec .Dr. Fatima Fadhil Abbas Wadi	**Physcis**	**Laser and Electro-Optics**			✓	
41	Lec .Dr. Ruaa Hilal Hassani Daher	**Physcis**	**NanoMaterials**			✓	
42	Lec .Dr.Reyam Abdul Hussein Noori Radhi.	**Physcis**	**Nuclear Physcics**			✓	
43	Lec .Dr.Mohammed Jumaah Tuama	**Physcis**	**Thin Films**			✓	
44	Lec .Hussein Mahdi Hamad Fankhar	**Mechanical Engineering**	**Thermal Mechanics Engineering**			✓	
45	Lec .Ola Abdullah Manati Joudah	**Physcis**	**General Phscics**			✓	
46	Asst. Lec. Imad Kamil Zayer Daish	**Physcis**	**Astronomy**			✓	
47	Asst. Lec.Hoda Musa Mutlaq Attar	**Physcis**	**General Phscics**			✓	
48	Asst. Lec. Nagham Abd Ulameer yaseer Mosin	**Physcis**	**General Phscics**			✓	
49	Asst. Lec. Salman Rasool Salman Dawood	**Physcis**	**Remote sensing and image processing**			✓	
50	Asst. Lec. Adday Raddad Hussein Anfaweh	**Applied Physics**	**Communications**			✓	
51	Asst. Lec. kholoud dham khamkheem dhamosh	**Physcis**	**General Phscics**			✓	
52	Asst. Lec. Rusul Saeed Radhi abed	**Physcis**	**Nano physcis**			✓	
53	Asst. Lec. Zahraa Razzaq Dakhl Hussain	**Physcis**	**General Phscics**			✓	
54	Asst. Lec. Zainab Kareem Lateef Hassan	**Physcis**	**General Phscics**			✓	

55	Asst. Lec. Mohammed Jaber Mohammed Lahmood	**Physcis**	**General Phscics**			✓	
56	Asst. Lec. Noor Hussein Majeed Mohamed	**Physcis**	**sold state and materials physics**			✓	
57	Asst. Lec. Saif Jawad Kadhim Obaid	**Physcis**	**Theoretical and Molecular Physics**			✓	
58	Asst. Lec. Faraqad Faisal Aidan Mohammed	**Physcis**	**General Phscics**			✓	
59	Asst. Lec. Ali Kazim Hamad Mahrath	**Management and Economics**	**Accounting Economics**			✓	
60	Asst. Lec. Amer Shamil Abdulrahman Hussein	**Mathematics**	**Commutative Algebra**			✓	
61	Asst. Lec. Reem Hussein Abdullah Haris	**Physcis**	**General Phscics**			✓	
62	Asst. Lec. Wafaa Khudhair Salman Dhahir	**Physcis**	**General Phscics**			✓	
63	Asst. Lec. Inas Allawi Razzaq Gbr	**Physcis**	**General Phscics**			✓	
64	Asst. Lec. Hussein Abdul Ilah Yassin Sakhy	**Physcis**	**General Phscics**			✓	
65-	Software Engineer Sajjad Flaih Hassan Zaibel	**Computer Engineering**	**Computer Engineering**			✓	
66	Asst.physicist Alaa Lateef Shather Musa	**Physcis**	**General Phscics**			✓	
67	Asst.physicist Duaa Mohammed Rashad Kadhim	**Physcis**	**General Phscics**			✓	
68	Prof.Dr.Jafar Abbas Essa Jassim	**biology**	**biology**				✓
69	Lecture Dr. Ahmed Abdulhamid Rasan	**Arabic**	**Arabic**				✓

12.Professional Development

Mentoring new faculty members

Directing new faculty members to the need to work on developing the scientific method, methods of delivering scientific lectures, and how to deliver scientific material to students.

Professional development of faculty members

Faculty professional development aims to enhance academic and scientific competencies through continuous training programs and workshops, contributing to the improvement of teaching methods and the updating of scientific knowledge. It also focuses on developing research skills and effective communication with students to ensure high-quality educational outcomes.

The program supports ongoing faculty professional development through training, workshops, and seminars. These activities enhance teaching skills, curriculum design, modern pedagogy, assessment, and the integration of educational technologies. Faculties are also encouraged to conduct research,

13.Acceptance Criterion

Students who have completed and successfully passed secondary school (scientific branch) are eligible for admission to the College of Science, Department of Physics, provided they achieve a minimum average of 70% or higher.

publish in reputable journals, and collaborate with institutions worldwide to ensure high-quality education aligned with global standards.

14.The most important sources of information about the program

Key sources of information about the program include the university website, program specifications, the student handbook, official documents, quality assurance reports, and faculty guidance. In addition, the program relies on textbooks prescribed by the Ministry of Higher Education and Scientific Research, as well as external scientific references and publications. Students and faculty also make use of libraries and online resources, including the internet, to support learning and research activities.

15.Program Development Plan

The department adopts comprehensive academic and research development plans aimed at continuously improving the quality of the program. The Department Head, Department Council, and Scientific Committee work collaboratively to identify needs, set priorities, and ensure the provision of all necessary resources to support program development. These efforts include updating the curriculum, enhancing teaching and learning methods, supporting scientific research, and improving laboratory facilities, in alignment with quality assurance standards and labor market requirements.

Program Skills Outline

Required program Learning outcomes

Year/Level	Course Code	Course Name	Basic or optional	Knowledge				Skills				Ethics				General and Transferable Skills			
				A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4	D1	D2	D3	D4
Fourth Stage/ First Courses General Physcis	PHY-411	Nuclaear Physics I	C	✔	✔	✔	✔	✔	✔	✔		✔					✔		
	PHY-412	Solid State Physics I	C	✔	✔	✔		✔	✔	✔	✔	✔				✔			
	PHY-413	Electromagnatics Theory I	C	✔	✔	✔	✔	✔	✔	✔						✔			
	PHY-417	Optional III Radiation Physics	C	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔				✔		
	PHY-414	Nano-science	C	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔				✔	
	PHY-415	Mathematical Physics I	E	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔			✔	
	PHY-416	Research project	C	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔		✔	✔	✔	✔	✔
Fourth Stage/ Second Courses General Physcis	PHY-421	Nuclaear Physics II	C	✔	✔	✔		✔	✔	✔	✔	✔		✔				✔	
	PHY-422	Solid State Physics II	C	✔	✔		✔	✔	✔	✔	✔					✔			
	PHY-423	Electromagnatics Theory II	C	✔	✔	✔	✔	✔	✔	✔	✔	✔				✔			
	PHY-424	Plasma physics	C	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔			✔	
	PHY-425	Research project	C	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔						
	PHY-428	Biophysics	C	✔	✔	✔	✔	✔	✔	✔	✔	✔		✔					✔
	PHY-426	Mathematical Physics II	E	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔				✔	
	PHY-427	Optional IV Health Physics	C	✔	✔	✔	✔	✔	✔	✔		✔					✔		
Fourth Stage/ First Courses Medical Physcis	PHY-411	Medical Instrumentation I	C	✔	✔	✔	✔	✔	✔	✔	✔	✔		✔		✔			
	PHY-412	Radiation Biology	C	✔	✔	✔	✔	✔	✔			✔	✔	✔	✔		✔		
	PHY-413	Physics of Nuclear Medicine	C	✔	✔	✔	✔	✔	✔	✔		✔	✔	✔	✔		✔		
	PHY-414	Physics of Radiotherapy	C	✔	✔		✔	✔	✔	✔	✔	✔	✔	✔	✔		✔		
	PHY-415	Optional III (Mathematical Methods for Medical Physics)	E	✔	✔	✔	✔	✔	✔	✔	✔							✔	

	PHY-416	**Research project**	**C**	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Fourth Stage/ Second Courses Medical Physcis	**PHY-421**	**Medical Instrumentation II**	**C**	✔	✔		✔	✔	✔	✔	✔	✔		✔		✔			
	PHY-422	**Image processing**	**C**	✔	✔		✔	✔	✔	✔	✔				✔		✔		
	PHY-423	**Health Physics**	**C**	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔		✔		
	PHY-424	**Biophysics**	**C**	✔	✔		✔	✔	✔		✔	✔		✔						✔
	PHY-425	**Electromagnetic Theory**	**C**	✔	✔	✔		✔	✔	✔	✔					✔				
	PHY-426	**Optional IV (Medical statistics)**	**E**	✔	✔	✔	✔	✔	✔	✔	✔							✔		
	PHY-428	**Nanoscience in Medicine**	**C**	✔	✔	✔	✔	✔	✔	✔	✔	✔		✔				✔		
	PHY-429	**Research project**	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔

Fourth Stage
General Physcis

Theoretical Part

Course Description Form

1. Course Name:	
Solid State Physics I	
2. Course Code:	
PHY-412	
3. Semester / Year:	
First Semester / 2025−2026	
4. Description Preparation Date:	
25/9/2025	
5. Available Attendance Forms:	
Presence	
6. Number of Credit Hours (Total) / Number of Units (Total)	
Two theoretical hours, Two practical hours, and (3 Units)	
7. Course administrator's name (mention all, if more than one name)	
Name: **Abbas Fadhel Essa** **Email: afadhel@uowasit.edu.iq**	
8. Course Objectives	
Course Objectiv	• **Preparing students scientifically, professionally and culturally and enabling them to know scientific facts, concepts and theories.** • **Enabling students to apply scientific methods in addressing life and professional problems and situations.** • **Enabling the graduate to continue his higher studies and absorb the novelties and developments in t field of physics Sciences.** • **Helping students to acquire useful trends and values in line with the Arabic authenticity and the principles of the Islamic religion** • **And other heavenly religions .** • **Developing the trends and inclinations of students and developing their abilities to face current and future challenges.** • *** Development and development of ethical trends and values of scientific research**
9. Teaching and Learning Strategies	
Strategy	* Students should be able to adopt scientific thinking methods in the face of problems * Adoption of systematic methods of thinking in harmony with the form and content of available knowledge * Employ cognitive skills in nature * Adopting in-depth learning methods that guarantee understanding and application * Provide learners with
10. Course Structure	

Week	Hours	Required Learning Outcomes	Unit or subject name SSP (semester #1)	Learning method	Evaluation method
1	**2 Th.+2 Par.**	Understand the concept of phonons and analyze lattice vibrations in crystalline solids	• Phonons and lattice vibration • Inelastic scattering of photons by phonons	**Presence**	**Quizzes** **Assignments and Homework** **Written Examinations** **Laboratory Work**
2	**2 Th.+2 Par.**	Explain photon–phonon interactions and interpret inelastic scattering phenomena			
3	**2 Th.+2 Par.**	Distinguish between monatomic and diatomic lattices and describe their vibrational modes	• Monatomic and diatomic lattices		
4	**2 Th.+2 Par.**	Define and differentiate between phase and group velocities in wave propagation	• Phase velocity and group velocity		
5	**2 Th.+2 Par.**	Compare classical and Einstein models in explaining heat capacity of solids	• Heat capacity ,classical theory and Einstein model		
6	**2 Th.+2 Par.**	Apply Debye theory and explain the effect of anharmonicity on lattice properties	• Debye model ,enharmonic crystals		
7	**2 Th.+2 Par.**	Analyze thermal properties of materials and relate them to lattice behavior	• Thermal expansion ,thermal conductivity and thermal resistivity		
8	**2 Th.+2 Par.**	Explain classical models of electrical conductivity and their limitations	• Classical theory in conductivity (Drude and Lorentz) theory		
9	**2 Th.+2 Par.**	Apply quantum theory and Fermi–Dirac distribution to electron behavior in metals	• Hall effects		
10	**2 Th.+2 Par.**	Analyze the concept of density of states and its role in thermal properties	• Quantum free electron , Fermi – Dirac		
11	**2 Th.+2 Par.**	Explain and apply the relationship between thermal and electrical conductivity.	• Density of state ,thermal conductivity of metal		

12	**2 Th.+2 Par.**	Describe band structure and explain electron motion using the nearly free electron model	• Ratio of thermal to electrical conductivity (w. l(		
13	**2 Th.+2 Par.**	Explain energy band gaps and apply Bloch functions in periodic potentials	• Band theory ,Nearly free electron model		
14	**2 Th.+2 Par.**	Explain the origin of forbidden energy gaps in solids and apply **Bloch functions** to describe electron behavior in periodic crystal lattices.	• Forbidden energy gap and Block function		
15			First examination		

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

Course	daily exams	Daily assignments	Exam1	Exam2	Practical	Final -Exam
1st	4	4	10	10	12	60

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Solid state physics , kittle,8th, 2008
Main references (sources)	Solid state physics , kittle,8th, 2008
Recommended books and references (scientific journals, reports…)	Solis state physics, Blakmore
Electronic References, Websites	From internet

Course Description Form

1. Course Name:	
Solid State Physics II	
2. Course Code:	
PHY-422	
3. Semester / Year:	
First / 2025−2026	
4. Description Preparation Date:	
25/9/2025	
5. Available Attendance Forms:	
Presence	
6. Number of Credit Hours (Total) / Number of Units (Total)	
Two theoretical hours, Two practical hours, and (3 Units)	
7. Course administrator's name (mention all, if more than one name)	
Name: **Abbas Fadhel Essa** **Email: afadhel@uowasit.edu.iq**	
8. Course Objectives	
Course Objectives	• **Preparing students scientifically, professionally and culturally and enabling them to know scientific facts, concepts and theories.** • **Enabling students to apply scientific methods in addressing life and professional problems and situations.** • **Enabling the graduate to continue his higher studies and absorb the novelties and developments in t field of physics Sciences.** • **Helping students to acquire useful trends and values in line with the Arabic authenticity and the principles of the Islamic religion** • **And other heavenly religions .** • **Developing the trends and inclinations of students and developing their abilities to face current and future challenges.** • *** Development and development of ethical trends and values of scientific research**
9. Teaching and Learning Strategies	
Strategy	* Students should be able to adopt scientific thinking methods in the face of problems * Adoption of systematic methods of thinking in harmony with the form and content of available knowledge * Employ cognitive skills in nature * Adopting in-depth learning methods that guarantee understanding and application * Provide learners with
10. Course Structure	

Week	Hours	Required Learning Outcomes	Unit or subject name SSP (semester #2)	Learning method	Evaluation method
1	**2 Th.+2 Par.**	Explain effective mass and hole concept, and construct Fermi surfaces for electron systems.	• Effective mass ,holes and Fermi surfaces construction	**Presence**	**Quizzes** **Assignments and Homework** **Written Examinations** **Laboratory Work**
2	**2 Th.+2 Par.**	Describe band gap characteristics and compare properties of silicon and germanium	• Band gap, Silicon and Germanium		
3	**2 Th.+2 Par.**	Distinguish between intrinsic and doped semiconductors and explain doping mechanisms	• Intrinsic and extrinsic semiconductors		
4	**2 Th.+2 Par.**	Analyze charge carrier mobility and its effect on electrical conductivity	• Mobility and electrical conductivity		
5	**2 Th.+2 Par.**	Identify types of point and line defects and evaluate their effects on material properties	• Point and line defects		
6	**2 Th.+2 Par.**	Describe surface and bulk defects and analyze their influence on physical behavior	• Surface and volume defects		
7	**2 Th.+2 Par.**	Explain superconductivity and define the concept of critical temperature	• Superconductivity , Critical temperature		
8	**2 Th.+2 Par.**	Describe the Meissner effect and interpret superconductivity using BCS theory	• Meissnar effect and BCS theory		
9	**2 Th.+2 Par.**	Identify practical applications of superconductors in technology and industry	• Uses of superconductivity		
10	**2 Th.+2 Par.**	Explain characteristics and significance of high-temperature superconductors	• High temperature superconductors		
11	**2 Th.+2 Par.**	Classify different magnetic behaviors in materials	• Magnetic properties		
12	**2 Th.+2 Par.**	Distinguish between diamagnetism and paramagnetism and explain their physical origins	• Diamagnetic and paramagnetic		
13	**2 Th.+2 Par.**	Distinguish between ferromagnetic and	• Ferromagnetic and antiferromagnetic		

		antiferromagnetic materials and explain their magnetic ordering and behavior			
14	**2 Th.+2 Par.**	Explain the principles of nuclear magnetic resonance and its applications in physics and medical imagin	• Nuclear magnetic resonance		
15			Second examination		

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

Course	daily exams	Daily assignments	Exam1	Exam2	Practical	Final -Exam
2nd	**4**	**4**	**10**	**10**	**12**	**60**

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Solid state physics , kittle,8th, 2008
Main references (sources)	Solid state physics , kittle,8th, 2008
Recommended books and references (scientific journals, reports…)	Solis state physics, Blakmore
Electronic References, Websites	From internet

Course Description Form

1. Course Name
Nuclear Physics1
2. Course Code
PHY-411
3. Semester / Year
First Semester 2025/2026
4. Description Preparation Date:
10/9/2025
5. Available Attendance Forms
Actual Attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
(2 Theory+2 Practical)/3 unit
7. Course administrator's name (mention all, if more than one name)
Name: Prof.Dr. Hadi Dwaich ALattabi **Email: alattabih@uowasit.edu.iq**
8. Course Objectives

Course Objectives	**The course (Nuclear Physics) aims to teach the student the most important basic principles in terms of theories, rules, and general laws in the specialty of nuclear physics, with theoretical and mathematical aspects that revolve around the nucleus in addition to the atom, to make the student have the ability to understand, perceive, and know within the six levels of thinking (Bloom) and enhancing his mental abilities, leading to the student's mental violence**

9. Teaching and Learning Strategies	
Strategy	-Group discussions and assignments -Creating an atmosphere of competition among students and treating individual differences using appropriate educational methods. -Research groups - nested discussion circles. - Teaching methods include the use of educational technology. - Encouraging students to self-learn.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	**(2 Th+2 par.)**	• Understand the basic principles of atomic and nuclear physics. • Apply the concepts of special relativity in solving physical problems. • Solve numerical examples related to relativistic effects such as time dilation and mass–energy equivalence.	Introduction to atomic and nuclear physics and solving examples of the theory of relativity Introduction to atomic and nuclear physics and solving examples of the theory of relativity	**Theoretical**	**Daily preparation, daily and oral exams on the board and assignments**
2	**(2 Th+2 par.)**	Structure of the atom and nucleus and their basic properties.	**Atom and nucleus**	**Theoretical**	**Daily preparation, daily and oral exams on the board and assignments**
3	**(2 Th+2 par.)**	Nuclear binding energy and its applications with solved examples.	**Nuclear binding energy with applied examples**	**Theoretical**	**Daily preparation, daily and oral exams on the board and assignments**
4	**(2 Th+2 par.)**	Nuclear energy levels and their structure.	**Nuclear energy levels**	**Theoretical**	**Daily preparation, daily and oral exams on the board and assignments**
5	**(2 Th+2 par.)**	Energy associated with nuclear decay (alpha, beta, and gamma emissions).	**The energy associated with nuclear decay (gamma, alpha, beta)**	**Theoretical**	**Daily preparation, daily and oral exams on the board and assignments**
6	**(2 Th+2 par.)**	Energy released in nuclear decay processes (alpha, beta, and gamma radiations.	**The energy associated with nuclear decay (gamma, alpha, beta)**	**Theoretical**	**Daily preparation, daily and oral exams on the board and assignments**
7	**(2 Th+2 par.)**	Electron–proton annihilation and energy conversion processes.	**Electron-proton annihilation**	**Theoretical**	**Daily preparation, daily and oral exams on the board and assignments**
8	**(2 Th+2 par.)**	Law of radioactive decay and its mathematical description**.**	Mid-term Exam		**written exams**

9	**(2 Th+2 par.)**	Law of radioactive decay and its mathematical description.	**Law of radial decay**	**Theoretical**	**Daily preparation, daily and oral exams on the board and assignments**
10	**(2 Th+2 par.)**	Applications of specific activity (SA) with illustrative examples.	**Applications of specific effectiveness (SA), examples**	**Theoretical**	**Daily preparation, daily and oral exams on the board and assignments**
11	**(2 Th+2 par.)**	Nuclear reactions: general principles and reaction mechanisms.	**Nuclear reactions, general notes, movements of nuclear reactions**	**Theoretical**	**Daily preparation, daily and oral exams on the board and assignments**
12	**(2 Th+2 par.)**	Nuclear fission reactions and energy release.	**Nuclear fission reaction**	**Theoretical**	**Daily preparation, daily and oral exams on the board and assignments**
13	**(2 Th+2 par.)**	Energy loss and radiation penetration in matter and Coulomb interactions.	**Energy loss and radiation penetration through matter, Coulombic interactions**	**Theoretical**	**Daily preparation, daily and oral exams on the board and assignments**
14	**(2 Th+2 par.)**	Penetration and behavior of radiation (X-rays) in matter.	**Hysteresis rays**	**Theoretical**	**Daily preparation, daily and oral exams on the board and assignments**
15	**(2 Th+2 par.)**	Stopping power due to ionization and excitation of charged particles (p, d, t, α).	**The stopping power arising from ionization and excitation of (p, d, t, α) particles**	**Theoretical**	**Daily preparation, daily and oral exams on the board and assignments**
16	**(2 Th+2 par.)**	Stopping power of protons in matter.	**The stopping power of protons**	**Theoretical**	**Daily preparation, daily and oral exams on the board and assignments**

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

Course	daily exams	Daily assignments	Exam1	Exam2	Practical	Final - Exam
1st	4	4	10	10	12	60

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Mesurment and Detection of Radiation " McGRAW – Hill Tsou lfanidis (1995
Main references (sources)	Meyerhof's book (Introduction to Nuclear Physics). Author Anka's book (Fundamentals of Nuclear Physics)
Electronic References	Websites

Course Description Form

1. Course Name
Nuclear Physics II
2. Course Code
PHY–421
3. Semester / Year
Second Semester2025–2026
4. Description Preparation Date:
1/2/2026
5. Available Attendance Forms
Actual Attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
(2 Theory+2 Practical)/3 unit
7. Course administrator's name (mention all, if more than one name)
Name: Prof.Dr. Hadi Dwaich ALattabi **Email: alattabih@uowasit.edu.iq**
8. Course Objectives

Course Objectives	**The course (Nuclear Physics) aims to teach the student the most important basic principles in terms of theories, rules, and general laws in the specialty of nuclear physics, with theoretical and mathematical aspects that revolve around the nucleus in addition to the atom, to make the student have the ability to understand, perceive, and know within the six levels of thinking (Bloom) and enhancing his mental abilities, leading to the**

	student's mental violence

9. Teaching and Learning Strategies

Strategy	**-Group discussions and assignments** **-Creating an atmosphere of competition among students and treating individual differences us appropriate educational methods.** **-Research groups - nested discussion circles.** **- Teaching methods include the use of educational technology.** **- Encouraging students to self-learn.**

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	*(2 Th+1 Tu)*	Understand the stopping ability of deceleration (bremsstrahlung) radiation in matter	**Stopping ability for deceleration rays**	**Theoretical**	**Daily preparation, daily and oral exams on the board and assignments**
2	*(2 Th+1 Tu)*	Solve numerical problems related to stopping power for different types of charged particles	**Solve applied examples of the stopping power of different particles**	**Theoretical**	**Daily preparation, daily and oral exams on the board and assignments**
3	*(2 Th+1 Tu)*	Explain and determine the range of charged and heavy particles in matter	**Range of charged**	**Theoretical**	**Daily preparation, daily and oral exams on the board and assignments**
4	*(2 Th+1 Tu)*	Range of charged particles and heavy particles in matter.	**particles, range of heavy particles**	**Theoretical**	**Daily preparation, daily and oral exams on the board and assignments**
5	**(2 Th+1 Tu)**	Apply range–energy relationships for electrons and protons with solved examples	**The term for electrons and protons with solutions and applied examples**	**Theoretical**	**Daily preparation, daily and oral exams on the board and assignments**
6	**(2 Th+1 Tu)**	Analyze the stopping power of heavy ions with atomic mass A > 2 and atomic number Z > 2	**Heavy ion stopping ability (A>2, Z>2)**	**Theoretical**	**Daily preparation, daily and oral exams on the board and assignments**
7	**(2 Th+1 Tu)**	Determine the range of heavy ions in different materials	**Range for heavy ions (A>2)**	**Theoretical**	**Daily preparation, daily and oral exams on the board and assignments**

		using theoretical and applied models			
8	**(2 Th+1 Tu)**		Mid-term Exam		**written exams**
9	**(2 Th+1 Tu)**	Explain the interaction mechanisms of gamma rays and X-rays with matter	**Interactions of gamma rays and X-rays with matter**	**Theoretical**	**Daily preparation, daily and oral exams on the board and assignments**
10	**(2 Th+1 Tu)**	Describe and distinguish between photoelectric effect, Compton scattering, and pair production processes.	**Compton scattering, pair production, photoelectric phenomenon**	**Theoretical**	**Daily preparation, daily and oral exams on the board and assignments**
11	**(2 Th+1 Tu)**	Calculate and apply total attenuation and energy absorption coefficients with practical examples	**Total attenuation coefficient, photon energy absorption coefficient with practical examples**	**Theoretical**	**Daily preparation, daily and oral exams on the board and assignments**
12	**(2 Th+1 Tu)**	Analyze neutron interactions with matter and solve related applied problems considering influencing factors.	**Increasing factors, interaction of neutrons with matter, and solving applied examples**	**Theoretical**	**Daily preparation, daily and oral exams on the board and assignments**
13	**(2 Th+1 Tu)**	Understand basic nuclear models with emphasis on the liquid drop model and its implications	**Introduction to nuclear models, liquid drop model**	**Theoretical**	**Daily preparation, daily and oral exams on the board and assignments**
14	**(2 Th+1 Tu)**	Describe the peaceful applications of nuclear energy in medicine, industry, and power generation	**A brief overview of the peaceful use of nuclear energy**	**Theoretical**	**Daily preparation, daily and oral exams on the board and assignments**
15	**(3 h)**	Explain basic concepts and applications of nanotechnology in modern science and technology	**A brief overview of nanotechnology**	**Theoretical**	**Daily preparation, daily and oral exams on the board and assignments**
16	**(3 h)**		**Final Exam**	**Theoretical**	**Daily preparation, daily and oral exams on the board and assignments**

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

Course	daily exams	Daily assignments	Exam1	Exam2	Practical	Final -Exam
1st	4	4	10	10	12	60

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Mesurment and Detection of Radiation " McGRAW – Hill Tsou lfanidis (1995
Main references (sources)	Meyerhof's book (Introduction to Nuclear Physics). Author Anka's book (Fundamentals of Nuclear Physics)
Electronic References	Websites

Course Description Form

1. Course Name:
Electromagnatics Theory I
2. Course Code:
PHY-413
3. Semester / Year: 4th stage
2025–2026 – 1ST Semester
4. Description Preparation Date:
25/9/2025
5. Available Attendance Forms:
Actual Attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
(2 theory)/Total 30 hours /2 unit
7. Course administrator's name (mention all, if more than one name)

Name: Prof. Dr. Hashim Ali Yusr
Email: hashim@uowasit.edu.iq

8. Course Objectives

Course Objectives	• Providing Students with knowledge of the principles of electromagnetic theory • – Developing positive attitudes towards electromagnetic theory • – Identifying research methods in electromagnetic theory • – Identify the basic concepts in electromagnetic theory • – Identify the basic trends in electromagnetic theory • – Identifying the objectives of electromagnetic theory • – Forming Students' knowledge of the historical development of the concept electromagnetic theory • – Identify the components of the basic properties of electromagnetic theory • – Learn about the basic information of vector algebra and the basic laws vectors • – Acquire theoretical knowledge in the basic laws of electrostatics • – Identify the Poisson and Laplace equations • – Evaluating the performance characteristics of electromagnetic theory • – Acquiring skills in the topics of magnetic theory and its applications

9. Teaching and Learning Strategies

Strategy	- Method of Lecture, discussion and brainstorm - Teaching methods include the use of educational technology - Encouraging students to self-learn

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Knowledge and understanding the Vector analysis and vector algebra	Vector analysis vector algebra	Method of Lecture, discussion and brainstorm	QUIZ. and EXAM
2	2	Knowledge and understanding Gradient ,divergence ,curl	Gradient ,divergence ,curl	Method of Lecture, discussion and brainstorm	QUIZ. and EXAM
3	2	Knowledge and understanding Electrostatics :coulomb laws	Electrostatics :coulomb laws	Method of Lecture, discussion and brainstorm	QUIZ. and EXAM
4	2	Knowledge and understanding Electric field ,potential	Electric field ,potential	Method of Lecture, discussion and brainstorm	QUIZ. and EXAM

5	2	Knowledge and understanding Conductors , insulators	Conductors , insulators	Method of Lecture, discussion and brainstorm	QUIZ. and EXAM
6	2	Knowledge and understanding Gauss's law, electric dipole	Gauss's law, electric dipole	Method of Lecture, discussion and brainstorm	QUIZ. and EXAM
7	2	Knowledge and understanding Poisson's eq. ,Laplace eq.	Poisson's eq. ,Laplace eq.	Method of Lecture, discussion and brainstorm	QUIZ. and EXAM
8	2	Knowledge and understanding Uniqueness theorem	Uniqueness theorem	Method of Lecture, discussion and brainstorm	QUIZ. and EXAM
9	2	Knowledge and understanding Method of image	Method of image	Method of Lecture, discussion and brainstorm	QUIZ. and EXAM
10	2	Knowledge and understanding Resistance and capacitance	Resistance and capacitance	Method of Lecture, discussion and brainstorm	QUIZ. and EXAM
11	2	Knowledge and understanding Electrostatics field in dielectric	Electrostatics field in dielectric	Method of Lecture, discussion and brainstorm	QUIZ. and EXAM
12	2	Knowledge and understanding Electrostatics energy	Electrostatics energy	Method of Lecture, discussion and brainstorm	QUIZ. and EXAM
13	2	Knowledge and understanding Energy density ,	Energy density ,	Method of Lecture, discussion and brainstorm	QUIZ. and EXAM
14	2	Knowledge and understanding Convection and conduction current	Convection and conduction current	Method of Lecture, discussion and brainstorm	QUIZ. and EXAM
15	2	Knowledge and understanding Current density ,eq. of continuity	Current density ,eq. of continuity	Method of Lecture, discussion and brainstorm	QUIZ. and EXAM
16	2	Exam	Exam		

11. Course Evaluation

1. Follow up daily attendance.
2. Daily Quiz
3. Monthly Exam
4. Final exam
5. grades for participation to solve questions during the lecture

6. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Foundations of Electromagnetic

	Theory (4th Edition) By John R. Reitz, Frederick J. Milford
Main references (sources)	
Recommended books and references (scientific journals, reports…)	
Electronic References, Websites	

Course Description Form

1. Course Name:	
Electromagnatics Theory II	
2. Course Code: /	
PHY-423	
3. Semester / Year:	
2nd Semester /2025-2026	
4. Description Preparation Date:	
1/2/2026	
5. Available Attendance Forms:	
Actual Attendance/ Weekly	
6. Number of Credit Hours (Total) / Number of Units (Total)	
(2 theory)/Total 30 hours /2 unit	
7. Course administrator's name (mention all, if more than one name)	
Name: Prof. Dr. Hashim Ali Yusr **Email: hashim@uowasit.edu.iq**	
8. Course Objectives	
Course Objectives	• **Providing Students with knowledge of the principles of electromagnetic theory** • **- Developing positive attitudes towards electromagnetic theory** • **- Identifying research methods in electromagnetic theory** • **- Identify the basic concepts in electromagnetic theory** • **- Identify the basic trends in electromagnetic theory** • **- Identifying the objectives of electromagnetic theory** • **- Forming Students' knowledge of the historical development of the concept electromagnetic theory** • **- Identify the components of the basic properties of electromagnetic theory**

	• – Identify the basic information about magnetism • – Acquiring theoretical knowledge in the basic laws of the magnetic field • – Identify the Biot–Savart equations and Ampere's law • – Learn about Maxwell's equations in electromagnetism • – Acquiring skills in the topics of magnetic theory and its applications

9. Teaching and Learning Strategies

Strategy	- Method of Lecture, discussion and brainstorm - Teaching methods include the use of educational technology - Encouraging students to self-learn

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Knowledge and understanding Magnetic field of steady current	Magnetic field of steady current	Method of Lecture, discussion and brainstorm	QUIZ. and EXAM
2	2	Knowledge and understanding Biot & savart law	Biot & savart law	Method of Lecture, discussion and brainstorm	QUIZ. and EXAM
3	2	Knowledge and understanding Ampere law	Ampere law	Method of Lecture, discussion and brainstorm	QUIZ. and EXAM
4	2	Knowledge and understanding Magnetic scalar	Magnetic scalar	Method of Lecture, discussion and brainstorm	QUIZ. and EXAM
5	2	Knowledge and understanding vector potential	vector potential	Method of Lecture, discussion and brainstorm	QUIZ. and EXAM
6	2	Knowledge and understanding Magnetic torque and moment	Magnetic torque and moment	Method of Lecture, discussion and brainstorm	QUIZ. and EXAM
7	2	Knowledge and understanding Magnetic dipole	Magnetic dipole	Method of Lecture, discussion and brainstorm	QUIZ. and EXAM
8	2	Knowledge and understanding magnetization in materials	magnetization in materials	Method of Lecture, discussion and brainstorm	QUIZ. and EXAM
9	2	Knowledge and understanding Classification of magnetic materials	Classification of magnetic materials	Method of Lecture, discussion and brainstorm	QUIZ. and EXAM
10	2	Knowledge and understanding Magnetic boundary condition	Magnetic boundary condition	Method of Lecture, discussion and brainstorm	QUIZ. and EXAM
11	2	Knowledge and understanding Magnetic energy	Magnetic energy	Method of Lecture, discussion and brainstorm	QUIZ. and EXAM
12	2	Knowledge and understanding energy	energy density	Method of Lecture, discussion and	QUIZ. and EXAM

		density		brainstorm	
13	2	Knowledge and understanding Forces on magnetic materials	Forces on magnetic materials	Method of Lecture, discussion and brainstorm	QUIZ. and EXAM
14	2	Knowledge and understanding Hysteresis loss	Hysteresis loss	Method of Lecture, discussion and brainstorm	QUIZ. and EXAM
15	2	Knowledge and understanding Maxwell's eqs.	Maxwell's eqs.	Method of Lecture, discussion and brainstorm	QUIZ. and EXAM
16	2	Exam	Exam		

11. Course Evaluation

7. Follow up daily attendance.
8. Daily Quiz
9. Monthly Exam
10. Final exam
11. grades for participation to solve questions during the lecture

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Foundations of Electromagnetic Theory (4th Edition) By John R. Reitz, Frederick J. Milford
Main references (sources)	
Recommended books and references (scientific journals, reports…)	
Electronic References, Websites	

1. Course Name: Mathematical physics 1
Mathematical Physics I
2. Course Code :
PHY-415
3. Semester / Year
First Semester(2026-2025)/4th stage /general
4. Description Preparation Date:.
25/9/2025
5. Available Attendance Forms
Actual Attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
30 hours, 2 hours per week * 15 weeks / 2 units
7. Course administrator's name (mention all, if more than one name)
Name:Dr. Faiq Jameel Hassan Email: @uowasit.edu.iq
8. Course Objectives

Course Objectives	**- It makes the student familiar and aware of the most important characteristics of the course.** **- Enabling the student to understand the concept of special functions** **- Enabling the student to understand the concept of the Bessel equation and how to solve it** **- Enabling the student to understand the concept of the gender equation and how to solve it** **- Enabling the student to understand the concept of Laplace transforms** **- Enabling the student to understand the concept of inverse Laplace transforms and solve equations**

9. Teaching and Learning Strategies

Strategy	Group discussions and assignments Creating an atmosphere of competition among students and treating

	individual differences using appropriate educational methods Research groups - nested discussion circles. - Teaching methods include the use of educational technology - Encouraging students to self-learn.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	(2 **Th)**	Gamma and Error functions and Beta function	Special Function	**Deliverance - discussion**	**General questions and discussion**
2	(2 **Th)**	Gamma and Error functions and Beta function	Special Function	**Deliverance - discussion**	**General questions and discussion**
3	(2 **Th)**	Solution of Bessel's differential equation	Bessel's differential equation	**Deliverance - discussion**	**General questions and discussion**
4	(2 **Th)**	Solution of Bessel's differential equation	Bessel's differential equation	**Deliverance - discussion**	**General questions and discussion**
5	(2 **Th)**	Solution of Bessel's differential equation	Bessel's differential equation	**Deliverance - discussion**	**General questions and discussion**
6	(2 **Th)**	Legendre's polynomials and generating function and Legendre's differen equation. Rodrigues formula and recursive relations	Legendre's differential equation	**Deliverance - discussion**	**General questions and discussion**
7	(2 **Th)**	Legendre's polynomials and generating function and Legendre's differen equation. Rodrigues formula and recursive relations	Legendre's differential equation	**Deliverance - discussion**	**General questions and discussion**
8	(2 **Th)**	Laplace transform	Laplace transform		**General questions and discussion**
9	(2 **Th)**	Laplace transform	Laplace transform	**Deliverance - discussion**	**General questions and discussion**
10	(2 **Th)**	Laplace transform	Laplace transform	**Deliverance - discussion**	**General questions and discussion**
11	(2 **Th)**	Laplace transform	Laplace transform	**Deliverance - discussion**	**General questions and discussion**
12	(2 **Th)**	Inverse Laplace transfor	Laplace transform	**Deliverance - discussion**	**General questions and discussion**
13	(2 **Th)**	Inverse Laplace transfor	Laplace transform	**Deliverance - discussion**	**General questions and discussion**
14	(2 **Th)**	Inverse Laplace transfor	Laplace transform	**Deliverance - discussion**	**General questions and discussion**
15	(2 **h)**	Inverse Laplace transfor	Laplace transform	**Deliverance - discussion**	**General questions and discussion**
16	(2h)		**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

Course	Daily preparation, daily and oral exams	Daily assignments	Reports	Seminars	Mid-term Exam	Final -Exam
1st	10	10	5	5	10	60

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	G Farkhad, Mathematical Methods for Physics: Problems and Solutions, 2023
Main references (sources)	Arfekn, Mathematical Methods for Physicists 7e.
Recommended books and references (scientific journals, reports…)	H. J. Weber and G. B. Arfken, "Essential Mathematical Methods for Physicists", Academic Press, 2003.
Electronic References, Websites	Methods in Applied Mathematics authored by Dr. Basil Yaqoub Youssef, University of Basra – Iraq,9191. ،

Course Description Form

1. Course Name Mathematical physics 2

Mathematical physics II	
2. Course Code Department of Physical Sciences - forth Stage Medical physics	
PHY-426	
3. Semester / Year	
Second Semester(2025-2026) /4th stage /general	
4. Description Preparation Date:.	
1/2/2026	
5. Available Attendance Forms	
Actual Attendance	
6. Number of Credit Hours (Total) / Number of Units (Total)	
30 hours, 2 hours per week * 15 weeks / 2 units	
7. Course administrator's name (mention all, if more than one name)	
Name:Dr. Faiq Jameel Hassan **Email: @uowasit.edu.iq**	
8. Course Objectives	
Course Objectives	**- It makes the student familiar and aware of the most important characteristics of the course.** **- Enabling the student to understand the concept of generalized coordinates** **- Enabling the student to understand complex numbers and represent them** **- Enabling the student to understand complex functions, their derivation and integration** **- Enabling the student to understand the concept of publishing functions using immediate strings**
9. Teaching and Learning Strategies	
Strategy	Group discussions and assignments Creating an atmosphere of competition among students and treating individual differences using appropriate educational methods Research groups - nested discussion circles. - Teaching methods include the use of educational technology - Encouraging students to self-learn.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	(2 Th)	Curvilinear coordinate systems Gradient, Divergence, Curl and Laplacian in orthogonal Curvilinear coordinate	Vector Calculus	Deliverance - discussion	General questions and discussion
2	(2 Th)	Curvilinear coordinate systems Gradient, Divergence, Curl and Laplacian in orthogonal Curvilinear coordinate	Vector Calculus	Deliverance - discussion	General questions and discussion
3	(2 Th)	Special coordinate syste Rectangular Cartesian coordinate	coordinate systems	Deliverance - discussion	General questions and discussion
4	(2 Th)	Special coordinate syste Rectangular Cartesian coordinate	coordinate systems	Deliverance - discussion	General questions and discussion
5	(2 Th)	Special coordinate syste Rectangular Cartesian coordinate	coordinate systems	Deliverance - discussion	General questions and discussion
6	(2 Th)	Complex Numbers Arga diagram	Complex Numbers	Deliverance - discussion	General questions and discussion
7	(2 Th)	Complex Numbers Arga diagram	Complex Numbers	Deliverance - discussion	General questions and discussion
8	(2 Th)	Functions of a Complex variable Analytic Functi	Functions of a Complex variable		General questions and discussion
9	(2 Th)	Functions of a Complex variable Analytic Functi	Functions of a Complex variable	Deliverance - discussion	General questions and discussion
10	(2 Th)	Functions of a Complex variable Analytic Functi	Functions of a Complex variable	Deliverance - discussion	General questions and discussion
11	(2 Th)	Functions of a Complex variable Analytic Functi	Functions of a Complex variable	Deliverance - discussion	General questions and discussion
12	(2 Th)	Laurent theorem Singul point The residue theor Periodic functions Fouri Series	Laurent theorem Singular point The residue theorem Periodic functions Fourier Series	Deliverance - discussion	General questions and discussion
13	(2 Th)	Laurent theorem Singul point The residue theor Periodic functions Fouri Series	Laurent theorem Singular point The residue theorem Periodic functions Fourier Series	Deliverance - discussion	General questions and discussion

14	(2 **Th)**	Laurent theorem Singul point The residue theor Periodic functions Fouri Series	Laurent theorem Singular point The residue theorem Periodic functions Fourier Series	**Deliverance - discussion**	**General questions and discussion**
15	(2 **h)**	Laurent theorem Singul point The residue theor Periodic functions Fouri Series	Laurent theorem Singular point The residue theorem Periodic functions Fourier Series	**Deliverance - discussion**	**General questions and discussion**
16	(2h)		**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

Course	Daily preparation, daily and oral exams	Daily assignments	Reports	Seminars	Mid-term Exam	Final -Exam
2st	**10**	**10**	**5**	**5**	**10**	**60**

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	G Farkhad, Mathematical Methods for Physics: Problems and Solutions, 2023
Main references (sources)	Arfekn, Mathematical Methods for Physicists 7e.
Recommended books and references (scientific journals, reports…)	H. J. Weber and G. B. Arfken, "Essential Mathematical Methods for Physicists", Academic Press, 2003.
Electronic References, Websites	Methods in Applied Mathematics authored by Dr. Basil Yaqoub Youssef, University of Basra – Iraq,9191.

Course Description Form

1. Course Name:

Plasma Physics

2. Course Code:

PHY-424

3. Semester / Year:

Second Semester (Courses System)/2025 - 2026

4. Description Preparation Date:

1/2/2026

5. Available Attendance Forms:

Actual Attendance

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

30 hours (15 weeks in the 2nd course) 2 hours per week/2 unit

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

* Name: Asst. Prof. Dr. Firas Mohammed Dashour

* Email: faljaafari@uowasit.edu.iq

8. Course Objectives

Course Objectives	* Equip learners with knowledge of the principles of Plasma Physics. * Introduce the student to the principles of the states of matter and how to link the components of matter. * Identify the properties of the fourth state of matter. * Identify the forces affecting the behavior of transition to plasma. * Study the effect of regular and irregular electric and magnetic fields. * Learn about plasma applications in energy production, laser generation, and the interaction of lasers with plasma.

9. Teaching and Learning Strategies

Strategy	* Lecture method, discussion, and brainstorming. * Incorporating teaching methods using educational technology. * Encouraging students toward self-learning.

10. Course Structure

Week	Hours	Required learning outcomes	Unit or subject name (Theoretical)	Learning method (Practical)	Evaluation method
1	2	Mentioned within previous point according to the	Definition of Plasma - Saha Equation	Lecture - Discussion	Written Exams

		contents			
2	2	Differentiate between electron temperature, ion temperature, and neutral gas temperature in plasma. Explain the concept of local thermal equilibrium in plasma.	Concept of Temperature	Lecture - Discussion	Written Exams
3	2	Define Debye length and its significance in plasma quasi-neutrality. Derive the conditions for plasma formation (Debye number, plasma frequency). Calculate Debye length for a given plasma.	Debye Length - Plasma Conditions	Lecture - Discussion	Written Exams
4	2	Define the distribution function in phase space and derive the Vlasov and Boltzmann equations to describe collisionless and collisional plasmas. Analyze fundamental plasma phenomena such as Landau damping, plasma oscillations, and kinetic instabilities using velocity space concepts.	Kinetic Description of Plasma	Lecture - Discussion	Written Exams
5	2	Define mean free path and collisionality, and relate them to plasma density,	Collisionality & mean free path.	Lecture - Discussion	Written Exams

		temperature, and transport regimes.			
6	2	Classify electrostatic and electromagnetic waves in plasma (Langmuir, ion acoustic, Alfvén, and electromagnetic waves) and derive their dispersion relations.	Plasma Waves	Lecture - Discussion	Written Exams
7	2	Explain the cold plasma approximation (neglecting thermal pressure) and derive wave dispersion relations for unmagnetized and magnetized plasmas.	Cold Plasma Approximation	Lecture - Discussion	Written Exams
8	2	Derive the dispersion relation for ion-acoustic waves assuming cold ions and Boltzmann-distributed electrons, and explain the role of electron temperature and ion mass in wave propagation.	Ion-acoustic waves (cold ions).	Lecture - Discussion	Written Exams
9	2	Describe the effects of finite temperature on wave propagation, derive the dispersion relation for Langmuir waves	Warm Plasma & Kinetic Waves	Lecture - Discussion	Written Exams

		in warm plasma including thermal correction, and introduce kinetic wave phenomena.			
10	2	Derive the fluid equations (continuity, momentum, and energy) for a warm plasma, incorporating pressure gradients,	Fluid Description of a Warm Plasma	Lecture - Discussion	Written Exams
11	2	Derive the full dispersion relation for ion-acoustic waves including finite ion temperature, electron inertia, and Landau damping, and analyze the conditions for wave propagation and stability.	Ion-acoustic waves (full model)	Lecture - Discussion	Written Exams
12	2	Analyze the motion of a charged particle in uniform and non-uniform electric and magnetic fields, including gyration, drifts (E×B, gradient, curvature), and adiabatic invariants.	Single Particle Motion in Electromagnetic Fields	Lecture - Discussion	Written Exams
13	2	Describe the constant acceleration motion of a charged particle in a uniform electric field, and calculate its velocity and displacement as functions of time.	Motion in Uniform Electric Field Only	Lecture - Discussion	Written Exams

14	2	List the key assumptions of ideal MHD (single fluid, quasi-neutrality, infinite conductivity, negligible electron inertia, low-frequency, simplified Maxwell equations, isotropic pressure, high plasma parameter, and magnetic diffusion) and explain their physical implications such as frozen-in flux, zero resistive heating, and field slippage.	Magnetohydrodynamics (MHD)	Lecture - Discussion	Written Exams
15	2		Final practical exams + final theory exams	=	Exam.

11.Course Evaluation

Monitoring daily attendance. Conducting daily quizzes. Monthly exams. Final exam. Assigning participation marks for questions during the lecture.

Course	Daily preparation, daily and oral exams	Daily assignments	Reports	Seminars	Mid-term Exam	Final -Exam
2nd	5	5	5	5	20	60

12.Learning and Teaching Resources

Required Textbooks (Curricular Books, if any)	1. Introduction to Plasma Physics and Controlled Fusion Francis F Chen 2. Plasma Physics (Volume 4 of Modern Classical Physics) Kip S. Thorne & Roger D. Blandford 3. The Physics of Plasmas T. J. M. Boyd & J. J. Sanderson 4. Fundamentals of Plasma Physics Paul M. Bellan Principles of Plasma Discharges and Materials Processing Michael A. Lieberman & Allan J. Lichtenberg
Main References (Sources)	
Recommended Books and References (Scientific Journals, Reports...)	
Electronic References, Websites	

Course Description Form

1. Course Name:

Nano-Science

2. Course Code:

PHY-414

3. Semester / Year:

First Semester (Courses System)/2025 - 2026

4. Description Preparation Date:

25/9/2026

5. Available Attendance Forms:

Actual Attendance

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

30 hours (15 weeks in the first course)2hours per week/2 umit

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

* Name: Asst. Prof. Dr. Firas Mohammed Dashour

* Email: faljaafari@uowasit.edu.iq

8. Course Objectives

Course Objectives	This course aims to enable students to: 1. Understand the fundamental concepts of nanoscience and nanotechnology and the dimensions of the nanoscale. 2. Understand why the physical and chemical properties of materials differ at the nanoscale compared to the macroscale. 3. Identifying the types, classifications, and different structures of nanomaterials. 4. Studying methods for preparing nanomaterials using physical, chemical, and biological techniques. 5. Acquiring knowledge of nanomaterial characterization and analysis techniques. 6. Analyzing the physical properties of nanomaterials (electrical, optical, magnetic, and mechanical). 7. Linking nanoscience to its practical applications in the fields of medicine, energy, the environment, electronics, and sensors. 8. Developing scientific research skills and staying abreast of the latest developments in nanotechnology. 9. Enhancing analytical and critical thinking skills in interpreting nano-phenomena. 10. Preparing students to work with research applications.

9. Teaching and Learning Strategies

Strategy	The course strategy is based on integrating theoretical and applied learning to achieve a deep understanding of nanotechnology concepts and develop scientific research skills, through the following: Teaching and Learning Strategies * Theoretical Lectures Introducing the fundamental concepts of nanotechnology, supported by scientific examples and modern applications. * Discussion-Based Learning Encouraging students to engage in scientific dialogue, pose questions, and analyze as well as interpret nanoscale phenomena. * Problem-Based Learning (PBL) Studying real-world problems related to nanomaterial applications in medicine, energy, and the environment, and proposing scientific solutions for them. * Student Presentations Assigning students to prepare presentations on contemporary topics in nanotechnology to develop their research and presentation skills. * Practical and Laboratory Activities (If available) Learning about the synthesis and characterization methods of nanomaterials using various analytical techniques. * Self-Learning Assigning students to read modern scientific articles and research papers to enhance their scientific literacy and independent study skills. * Use of Modern Educational Tools Utilizing images, videos, and scientific simulations to illustrate abstract concepts at the nanoscale.

10. Course Structure

Week	Hours	Required learning outcomes	Unit or subject name (Theoretical)	Learning method (Practical)	Evaluation method
1	2Th	Intended Learning Outcomes (ILOs) By the end of this course, the student is expected to be able to: I. Knowledge and Understanding * Explain the fundamental concepts of nanoscience, nanotechnology, and the nanoscale. * Distinguish between the properties of materials at the nanoscale versus the bulk (traditional) scale. * Describe the different types of nanomaterials, their structures, and various synthesis methods.	Course Contents: Nanoscience and Nanotechnology The Nanotechnology course covers a range of theoretical and applied topics, including: * Introduction to Nanoscience, Nanotechnology, and the Nanoscale. .	Lecture - Discussion	Written Exams
2	2Th		* Historical Development of Nanoscience and its scientific and applied significance	Lecture - Discussion	Written Exams
3	**2Th**		* Physical Foundations of phenomena at the	Lecture -	Written

		* Identify characterization techniques for nanomaterials and their underlying working principles. II. Intellectual (Cognitive) Skills * Analyze the physical and chemical properties of nanomaterials and correlate them with their size and structure. * Interpret the results of analytical techniques such as XRD, SEM, and TEM in a scientifically correct manner. * Evaluate the efficiency of nanomaterials for specific applications. III. Practical and Professional Skills * Apply safety principles when handling nanomaterials and conducting nano-experiments (if available). * Prepare concise scientific reports related to nanotechnology topics. * Utilize modern scientific resources in the field of nanotechnology. IV. General and Transferable Skills * Work effectively within a team to accomplish scientific and research tasks. * Deliver clear scientific presentations using modern educational tools. * Develop self-learning skills and keep up with continuous scientific advancements.	nanoscale.	Discussion	Exams
4	**2Th**		* Physical Properties of nanomaterials (Electrical, Optical, and Magnetic).	Lecture - Discussion	Written Exams
5	**2Th**		* Classification of nanomaterials based on dimensions and structure.	Lecture - Discussion	Written Exams
6	**2Th**		* Nanoparticles: Types and characteristics.	Lecture - Discussion	Written Exams
7	**2Th**		* Carbon Nanotubes (CNTs) and their applications.	Lecture - Discussion	Written Exams
8	**2Th**		* Examination / Midterm Exam.	Lecture - Discussion	Written Exams
9	**2Th**		* Quantum Dots and their optical properties.	Lecture - Discussion	Written Exams
10	**2Th**		* Synthesis Methods of nanomaterials (Physical, Chemical, and Biological).	Lecture - Discussion	Written Exams
11	**2Th**		* Characterization Techniques for nanomaterials (XRD, SEM, TEM, AFM).	Lecture - Discussion	Written Exams
12	**2Th**		* Nanocomposites: Preparation, physical, and mechanical properties.	Lecture - Discussion	Written Exams
13	**2Th**		* Applications of Nanotechnology in Medicine, Energy, and the Environment.	Lecture - Discussion	Written Exams
14	**2Th**		* Occupational Safety and Ethics in Nanotechnology. * Modern Trends and future research in Nanoscience.	Lecture - Discussion	Written Exams
15	**2Th**		**Final theory exams**	=	Exam.

11.**Course Evaluation**

Monitoring daily attendance. Conducting daily quizzes. Monthly exams. Final exam. Assigning participation marks for questions during the lecture.

Course	Daily preparation, daily and oral exams	Daily assignments	Reports	Seminars	Mid-term Exam	Final -Exam
1st	**5**	**5**	**5**	**5**	**20**	**60**

12.Learning and Teaching Resources	
Required Textbooks (Curricular Books, if any)	Nanotechnology – Prof. Dr. Mohamed Sherif El-Iskandarani A scientific book that explains the basics of nanotechnology and its mair concepts in a simplified and systematic way.
Main References (Sources)	Textbook of Nanoscience and Nanotechnology – B. S. Murty et al. A comprehensive university textbook covering fundamental concepts, preparation, description, and applications, suitable for undergraduate and graduate students.
Recommended Books and References (Scientific Journals, Reports...)	1. Beilstein Journal of Nanotechnology 2. Journal of Experimental Nanoscience IEEE Transactions on Nanotechnology
Electronic References, Websites	• TryNano.org NanoHUB.org

1. Course Name:	
Radiation Physics	
2. Course Code:	
PHY-417	
3. Semester / Year:Fourth Stage	
First Semester/2025-2026	
4. Description Preparation Date:	
1-9-2025	
5. Available Attendance Forms:	
Actual Attendance	
6. Number of Credit Hours (Total) / Number of Units (Total)	
2 Theory in week/Total 30 hours/2 umit	
7. Course administrator's name (mention all, if more than one name)	
Name: Dr. Zainab ali Email: zainabali@uowasit.edu.iq	
8. Course Objectives	
Course Objectives	1. This course provides a study of the fundamental concepts of radiation, its natural and artificial sources, and ionizing and non-ionizing radiation. 2. Understanding the mechanisms of interaction between radiation and matter. It also explains the physical principles of the interaction processes between radiation and matter, methods of detection and measurement of radiation, in addition to the medical and industrial applications of radiation, with a focus on the concepts of radiation safety and protection from its risks through lectures and seminars.
9. Teaching and Learning Strategies	
Strategy	1. Interactive lectures: Use lectures to introduce basic and complex concepts related to the physics of radiation, while encouraging students to ask questions and participate in discussions. 2. Use of multimedia and technology 3. Evaluation and feedback: Continuous evaluation of students through tests, reports,

	and presentations while providing constructive feedback that helps improve the learning process. 4. Self-learning and research: Encouraging students to do self-research and explore the latest developments in the field of radiation, which helps in developing research skills and continuous learning. 5- Use of educational technology (data show) Oral discussions

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Accurate interpretation of radioactive phenomena using scientific precision	Classification of radiation	presence	Daily and oral exam and Assignments Monthly Exams For theoretical Subjects
2	2	calculation of radioactivity	Introduction to Radiation And its Types	presence	
3	2	operation and calibration of radiation detection equipment	The structure of matter	presence	
4	2	assessment of radiation risks	Radioactivity and unstable nuclei	presence	
5	2	implementation of appropriate safety procedures.	Radioactivity decay laws and half - life Monthly Exam	Presence	
6	2			presence	
7	2	Providing continuous learning opportunities for students and motivating them	Interaction of radiation with matter	presence	
8	2	Organized self-learning	Radiation Detection and Measurement	presence	
9	2	Social Media	Radiation protection and safety	presence	

10	2	self-management	Medical applications of radiation	presence	
11	2	General skills	Industrial and research applications of radiation	presence	
12	2	Mental skills	Monthly Exam	presence	
13	2	Radiation protection and safety	Biological effects of ionizing radiation	presence	
14	2	Medical applications of radiation	seminars	presence	
15	2		Final Exam	presence	

11. Course Evaluation

Distributing the score out of 100 according to the tasks assigned to the student:
Daily preparation 4
Quizz 3
Seminars 3
Monthly Exam 30
Final Exam 60

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	An Introduction to Radiation Protection Alan Martin ,Samuel A.Harbison
Main references (sources)	**Nuclear Radiation Physics,by R. Lapp and Andrews, Prentic-Hall(1972)**
Recommended books and references (scientific journals, reports…)	
Electronic References, Websites	**https://ucrfisicamedica.files.wordpress.com/2010/phys-of-radiation-therapy-3-edicion-khan.pd** https://secwww.jhuapl.edu/techdigest/Content/techest/pdf/V04-N01/04-01-Grant.pdf https://uomustansiriyah.edu.iq/media/lectures/9/9_10_03_29!05_32_53_PM.pdf wg

1. Course Name

Biophysics

2. Course Code:

PHY-428

3. Semester / Year

2nd Semester/2025-2026

4. Description Preparation Date 2026/2/1

1/2/2026

5. Available Attendance Forms:

Actual Attendance

6. Number of Credit Hours (Total) / Number of Units (Total): 2

2 Theory in week/Total 30 hours/2 umit

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

Name: Dr.Zeina Abbass Salman
Email: zsalman@uowasit.edu.iq

8. Course Objectives

Course Objectives	• **Provide basic understanding of the key concepts of biophysics through the application of physical principles, methods, and techniques.** • **Focus on making students able to identify physical laws and their role in biophysical phenomena and life.** • **Enable students to solve problems covering applications of physics in biological systems.** • **Enable students to use this information in their future fields of work, such as the fields of scientific research and practical experiences, in a way that contributes to serving society and developing the reality of education in it.**

9. Teaching and Learning Strategies

Strategy	• **Using presentation, participation, problem solving, and discussion.** • **Using modern technology for education and encouraging students to participate in group discussions.** • **Encouraging students to self-learn and form groups to discuss scientific material.**

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Understanding the biological structures	Introduction to Biological Structures	Lecture+ Discussion	Exams
2	2	Knowing and being able to	Structures and	=	=

		define the structures and formation of biomolecules	formation of Biomolecules		
3	2	Knowing the molecular structure of membranes	Molecular Structure of Membranes	Lecture	=
4	2	Understanding the fundamental concepts of thermodynamics	Fundamental Concepts of Thermodynamics	Lecture+ Discussion	=
5	2	Define the structure and function of cells	Cell Structure and Functions	=	=
6	2	Understanding the electrostatic fields in cells	Electrostatic Fields and Cells	Lecture	=
7	2	Understanding the self-assembly and stability in biological systems	Self-Assembly and Stability	=	=
8	2	Knowing DNA and its functions	DNA and its Functions	=	=
9	2	Understanding proteins and protein folding	Protein and Protein Folding	Lecture+ Discussion	=
10	2	Knowing and understanding Brownian motion of biomolecules	Brownian motion	=	=
11	2	Defining fluids and understanding their properties	Basic Properties of Fluids	=	=
12	2	Understanding the viscosity of biological fluids	Viscosity of Biological Fluids	=	=
13	2	Knowing the biomechanics of fluid behavior	Biomechanics of Fluid Behavior	=	=
14	2	Understanding the effects of electric fields on the motion of biomolecules	Electrophoresis	=	=
15	2	Knowing the difference between diffusion and osmosis and defining the osmotic pressures	Osmosis and Osmotic Pressures	=	=

11. Course Evaluation

Exams which include quizzes, midterms, and finals

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	1) Biophysics by Glasser, Springer Verlag(2001) 2) Biology in Physics: Is Life Matter by K. Bogdanov, Academic Press (2000)
Main references (sources)	1) Biophysics: An Introduction by C. Sybesma, Kluwer Academic (1989) 2) Introduction to Molecular Biophysics by J. Tuszynski, CRC Press (2003
Recommended books and references (scientific journals, reports…)	
Electronic References, Websites	Internet sites specialized in teaching and explaining biophysics and its concepts

1. Course Name:

Health Physics

2. Course Code:

PHY-427

3. Semester / Year:

2nd Semester / 2025 – 2026

4. Description Preparation Date:

1/2/2026

5. Available Attendance Forms:

Presence

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.Ali Jabbar Fraih

Email: alialzubeidy@uowasit.edu.iq

8. Course Objectives

Course Objectives	1- Understanding the fundamental principles of radiation protection and the safe use of ionizing and nonionizing radiation. 2- Measurement and evaluation of different types of radiation and radioactive materials. 3- Knowledge of the relationship between radiation exposure and biological effects. 4- Study of the movement and behavior of radioactive materials in the environment. 5- Application and design of effective radiation safety and protection measures. 6- Assessment of radiation hazards and recommendation of appropriate corrective actions. 7- Development of technical competency in radiation safety standards and professional practice.

9. Teaching and Learning Strategies

Strategy	1 -Interactive lectures explaining the scientific and engineering principles of radiation protection and safety. 2 -Problem-solving exercises to establish quantitative relationships between radiation exposure and biological effects. 3 -Seminar presentations by students on selected topics related to radiation safety and environmenta health. 4- Group discussions on radiation safety standards and their continuous development.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name QM	Learning method	Evaluation method

			(semester #2)		
1	2Th.	Define health physics and its role in radiation protection. Identify key sources of radiation exposure.	Introduction to Health Physics	Presence Interactive Seminars	Daily and monthly oral and written tests, homework.
2	2Th.	Explain radioactive decay processes. Apply decay laws to simple calculations.	Radioactivity & Transformation Mechanisms		
3	2Th.	Define activity and its units. Classify natural radiation sources.	Activity & Natural Radiation		
4	2Th.	Describe radioactive series transformations.Analyze decay chains	Series Transformations		
5	2Th.	Compare alpha and beta particles. Evaluate their interaction with matter	Alpha and Beta Particles		
6	2Th.	Explain gamma and neutron interactions. Distinguish between different radiation types	Gamma Rays and Neutrons		
7	2Th.	Use radiation units correctly. Assess external exposure risks	Radiation Units & External Exposure		
8	2Th.	Explain internal contamination mechanisms. Evaluate radionuclide behavior in the body.	Internal Exposure & Radionuclides		
9	2Th.	Describe dose-response relationships. Interpret biological effects of radiation.	Dose-Response Relationships		
10	2Th.	Explain internal dose calculation principles. Analyze dose distribution in tissues.	Internal Dosimetry		
11	2Th.	Distinguish between deterministic and stochastic effects. Evaluate radiation risks	Radiation Effects .		
12	2Th.	Define dose units (Gray, Sievert). Apply weighting factors in dose	Dose Units.		

		calculations.			
13	2Th.	Describe types of radiation detectors. Select appropriate instruments for measurement	Radiation Detection & Instrumentation .		
14	2Th.	Explain neutron detection methods. Apply calibration and statistical analysis	Neutron Measurement & Calibration		
15	2Th.	Evaluate radiation protection practices. Apply monitoring and safety procedures	Radiation Protection & Monitoring		
16	2Th.		Final Exam		

11. Course Evaluation

The grade is distributed out of 100 according to the tasks assigned to the student:
Daily preparation: 4
Daily quizzes: 3
Study sessions: 3
Monthly exam: 30
Final exam: 60

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	
Main references (sources)	HEALTH PHYSICS (BOOK) FOURTH EDITION Herman Cember and Thomas E. Johnson
Recommended books and references	Health Physics for Medical Physicist (BOOK) FIRST EDITION John Kildea
Electronic References, Websites	

Practical Part

Course Description Form

1. Course Name:
Nuclear Physics1 - Practical
2. Course Code:
3. Semester / Year: 4th stage
First semester / 2026/2025
4. Description Preparation Date:
2025/9/25
5. Available Attendance Forms:
Attendance / Biannual
6. Number of Credit Hours (Total) / Number of Units (Total)
2hour per week / 1 unit
7. Course administrator's name (mention all, if more than one name)
Name: - Prof. Dr. Hadi D. Z. - Prof. Mohamed Jebur Resen Email: maldhuhaibat@uowasit.edu.iq
8. Course Objectives

Course Objectives	• Enabling the student to deal with radioactive sources • The student's knowledge of comparing the results obtained practically with theoretical results • Identify some of the characteristics of nuclear radiation, ways to block it, and ways to reduce doses • Analyze data and discuss results

9. Teaching and Learning Strategies	
Strategy	• The ability to logically analyze experimental results • The ability to identify the factors affecting the achievement of the Alara principle • Ability to draw and discuss results

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Referred to in the previous axis, each according to the content	Concepts of occupational safety and laboratory work	Practical application	Written tests
2	2	=	**Operating Potential of**	Practical	Written tests

			Geiger-Muller Tube	application	
3	**2**	=	**Range of α- particles in the air**	Practical application	Written tests
4	**2**	=	**Mean range of β- particles in air**	Practical application	Written tests
5	**2**	=	• **The quantum flux of γ-radiation in air**	Practical application	Written tests
6	**2**	=	**Mid-term exam**	Practical application	Written tests
7	**2**	=	**Attenuation Properties of γ-Rays as a Function of Material Density**	Practical application	Written tests
8	**2**	=	**Attenuation Coefficient of Gamma-Rays in Copper**	Practical application	Written tests
9	**2**	=	**Geiger Counter Efficiency for Gamma Ray**	Practical application	Written tests
10	**2**	=	**Dose meter and Proving Inverse Square Law**	Practical application	Written tests
11	**2**	=	**Mid-term exam**	Practical application	Written tests
12	**2**	=	**Review and audit**		

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

Monthly exams	daily and oral exams	project or report	Experimental exams	Final exam
20	5	3	12	60 (40 theoretical +20 experimental)

12. Learning and Teaching Resources

Required textbooks (curricular books, if any	
Main references (sources)	Introduction to Nuclear and Particle Physics (Second Edition; A. Das & T. Ferbel)
Recommended books and references (scientific journals, reports…)	PHYWE SYSTEME GMBH · Robert−Bosch−Breite 10 · D−37079 · Göttingen ·
Electronic References, Websites	

1. Course Name:

Nuclear Physics II - Practical

2. Course Code:

3. Semester / Year:

Second Semester / 2025-2026

4. Description Preparation Date:

2026/2/1

5. Available Attendance Forms:

Attendance / Biannual

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

2hours per week / 1unit

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

Name: - Prof. Dr. Hadi D. Z.
- Prof. Mohamed Jebur Resen

Email: maldhuhaibat@uowasit.edu.iq

8. Course Objectives

Course Objectives	• Enabling the student to deal with radioactive sources • The student's knowledge of comparing the results obtained practically with theoretical results • Identify some of the characteristics of nuclear radiation, ways to block it, and ways to reduce doses • Analyze data and discuss results

9. Teaching and Learning Strategies

Strategy	• The ability to logically analyze experimental results • The ability to identify the factors affecting the achievement of the Alara principle • Ability to draw and discuss results

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Referred to in the previous axis, each according to the content	Concepts of occupational safety and laboratory work	Practical application	Written tests
2	2	=	**Attenuation Coefficient of Gamma-Rays in Copper**	Practical application	Written tests
3	2	=	**Planck`s constant and**	Practical	Written tests

			the photoelectric effect	application	
4	**2**	=	**Law of Radioactive decay**	Practical application	Written tests
5	**2**	=	• **Half-Life and Radioactive Equilibrium**	Practical application	Written tests
6	**2**	=	**Mid-term exam**	Practical application	Written tests
7	**2**	=	**Measure of Buildup Factor for Two-Layers Shields**	Practical application	Written tests
8	**2**	=	**Statistical variance and Gauss distribution**	Practical application	Written tests
9	**2**	=	**Differential Spectrum Analysis of Gamma Radiations**	Practical application	Written tests
10	**2**	=	**Back Scattering Factor of γ-Rays in Matter**	Practical application	Written tests
11	**2**	=	**Mid-term exam**	Practical application	Written tests
12	**2**	=	**Review and audit**		

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

Monthly exams	daily and oral exams	project or report	Experimental exams	Final exam
20	5	3	12	60 (40 theoretical +20 experimental)

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	
Main references (sources)	Introduction to Nuclear and Particle Physics (Second Edition; A. Das & T. Ferbel)
Recommended books and references (scientific journals, reports…)	PHYWE SYSTEME GMBH · Robert−Bosch−Breite 10 · D−37079 · Göttingen ·
Electronic References, Websites	

Course Description Form

1. Course Name:

Solid State Physics I/ Practical

2. Course Code:

3. Semester / Year: 4th stage

First Semester/ 2025−2026

4. Description Preparation Date:

25/9/2025

5. Available Attendance Forms:

Presence

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

Two practical hours, and (1 Units)

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

Name: Lec .Dr.Ahmed Abdulkadhim Thamer Khaj −Asst. Prof. Dr . Saba Farhan Hathot Jasim

Email: ahmed.kh@uowasit.edu.iq

8. Course Objectives

Course Objectives	**3. Preparing students scientifically, professionally and culturally and enabling them to know scientific facts, concepts and theories.** *** Enabling students to apply scientific methods in addressing life and professional problems and situations.** *** Enabling the graduate to continue his higher studies and absorb the novelties and developments in the field physics Sciences.** *** Helping students to acquire useful trends and values in line with the Arabic authenticity and the principles of the Islamic religion** **And other heavenly religions.** *** Developing the trends and inclinations of students and developing their abilities to face current and future challenges.** *** Development and development of ethical trends and values of scientific research**

9. Teaching and Learning Strategies

Strategy	* Students should be able to adopt scientific thinking methods in the face of problems * Adoption of systematic methods of thinking in harmony with the form and content of available knowledge * Employ cognitive skills in nature * Adopting in-depth learning methods that guarantee understanding and application * Provide learners with

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name SSP (semester #1 and #2)	Learning method	Evaluation method
1	2Par.		• **Crystal lattices and the seven crystal systems**	Presnce	Reports , quizz and Exam
2	2Par.		• **Studying the cubic lattices**		
3	2Par.		• **The Simple Cubic Crystal Structure:**		

4	2Par.		• **The Face-Centered Cubic Crystal Structure:**		
5	2Par.		• **The Body-Centered Cubic Crystal Structure:**		
6	2Par.		• **The volume of a primitive unit cell**		
7	2Par.		• **Number of atoms per unit cell.**		
8	2Par.		• **Atomic Packing Factor (APF)**		
9	2Par.		• **A:Diamond structure**		
10	2Par.		• **B:Cubic Zinc Sulfide Structure(ZnS)**		
11	2Par.		• **A:Sodium chloride structure(NaCl)**		
12	2Par.		• **B: Cesium chloride structure (CsCl)**		
13	2Par.		• **Hexagonal close-packed structure(hcp)**		
14	2Par.		• **Directions and planes in crystals: Miller indices**		
15	2Par.		• **Crystallographic directions**		

11. Course Evaluation	
Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, dailyoral, monthly, or written exams, reports .... etc	
12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	Solid state physics , kittle,8th, 2008
Main references (sources)	Solid state physics , kittle,8th, 2008
Recommended books and references (scientific journals, reports…)	Solis state physics, Blakmore
Electronic References, Websites	From internet

Course Description Form

1. Course Name:
Solid State Physics II/ Practical
2. Course Code:
3. Semester / Year: 4th stage
2nd Semester/ 2025−2026
4. Description Preparation Date:

25/9/2025

5. Available Attendance Forms:

Presence

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

Two practical hours, and (1 Units)

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

Name: Lec .Dr.Ahmed Abdulkadhim Thamer Khaj –Asst. Prof. Dr . Saba Farhan Hathot Jasim

Email: ahmed.kh@uowasit.edu.iq

8. Course Objectives

Course Objectives	**4. Preparing students scientifically, professionally and culturally and enabling them to know scientific facts, concepts and theories.** *** Enabling students to apply scientific methods in addressing life and professional problems and situations.** *** Enabling the graduate to continue his higher studies and absorb the novelties and developments in the field physics Sciences.** *** Helping students to acquire useful trends and values in line with the Arabic authenticity and the principles of the Islamic religion** **And other heavenly religions.** *** Developing the trends and inclinations of students and developing their abilities to face current and future challenges.** *** Development and development of ethical trends and values of scientific research**

9. Teaching and Learning Strategies

Strategy	* Students should be able to adopt scientific thinking methods in the face of problems * Adoption of systematic methods of thinking in harmony with the form and content of available knowledge * Employ cognitive skills in nature * Adopting in-depth learning methods that guarantee understanding and application * Provide learners with

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name SSP (semester #1)	Learning method	Evaluation method
1	2 par.		**Analysis of x-ray spectrum and achieve Braggs law**	Presence	Reports, daily exam quiz and Exam
2	2 par.		**Using x-ray to knowledge properties of unknown crystal structures**		
3	2 par.		**Find the distances between atoms for (KBr)crystal**		
4	2 par.		**Calculation planks constant**		

5	2 par.		**The relationship between intensity of x-ray and anod each of voltage and current**		
6	2 par.		**Calculation of Crystallite Size Using X-Ray Diffraction Data**		
7	2 par.		**The relationships between lights and the electrical output of solar cells**		
8	2 par.		**Hall Effect in Semiconductors**		
9			Exam		

11. Course Evaluation

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

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Solid state physics , kittle,8th, 2008
Main references (sources)	Solid state physics , kittle,8th, 2008
Recommended books and references (scientific journals, reports…)	Solis state physics, Blakmore
Electronic References, Websites	From internet

Fourth Stage
Medical Physcis

The medical Forth Stage

Theortical Part:

Course Description Form

1. Course Name:
Mathematical methods for medical physics
2. Course Code:
PHY-415
3. Semester / Year
1st Semester(2025−2026)/ Department of Physical Sciences - Fourth Stage Medical physics
4. Description Preparation Date:.
25/9/2025
5. Available Attendance Forms
Actual Attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
30 hours, 2 hours per week * 15 weeks / 2 units
7. Course administrator's name (mention all, if more than one name)
Name:D.r Nadia Naeema Email:nanaeema @uowasit.edu.iq
8. Course Objectives

Course Objectives	**- It makes the student familiar and aware of the most important characteristics of the course.** **- Enabling the student to understand the concept of generalized coordinates** **Enables the student to grasp the concept of vectors.** **- Enables the student to grasp the concept of differential calculus.** **- Enables the student to grasp the concept of matrices.** **- Enables the student to grasp the concept of special functions.**

9. Teaching and Learning Strategies	
Strategy	Group discussions and assignments Creating an atmosphere of competition among students and treating individual differences using appropriate educational methods Research groups

	- nested discussion circles. - Teaching methods include the use of educational technology - Encouraging students to self-learn.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	(2 Th)	All type of vectors	Introduction to vectors	Deliverance - discussion	General questions and discussion
2	(2 Th)	Add and subtract vectors	Vector Calculus	Deliverance - discussion	General questions and discussion
3	(2 Th)	Numerical and vector multiplication	Vector operation	Deliverance - discussion	General questions and discussion
4	(2 Th)	Curvilinear coordinate systems Gradient	Differential Calculus	Deliverance - discussion	General questions and discussion
5	(2 Th)	Curvilinear coordinate systems Divergence	Differential Calculus	Deliverance - discussion	General questions and discussion
6	(2 Th)	Curvilinear coordinate systems Curl	Differential Calculus	Deliverance - discussion	General questions and discussion
7	(2 Th)	Operations on Matrices	Matrices	Deliverance - discussion	General questions and discussion
8	(2 Th)	Invers of matrices	Problems solutions of matrices		General questions and discussion
9	(2 Th)		First exam	Deliverance - discussion	General questions and discussion
10	(2 Th)	Fundamental of Special function	Special Functions	Deliverance - discussion	General questions and discussion
11	(2 Th)	Gamma Function	Special Functions	Deliverance - discussion	General questions and discussion
12	(2 Th)	Beta function	Special Functions	Deliverance - discussion	General questions and discussion
13	(2 Th)	Ordinary differential equations	Ordinary differential equations	Deliverance - discussion	General questions and discussion
14	(2 Th)	Linear equation with constant coefficients	Linear equation with constant coefficients	Deliverance - discussion	General questions and discussion
15	(2 h)		Second Exam	Deliverance - discussion	General questions and discussion

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

Course	Daily preparation, daily and oral exams	Daily assignments	Exam	Final
1st	5	5	30	40

12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	G Farkhad, Mathematical Methods for Physics: Problems and Solutions, 2023
Main references (sources)	Arfekn, Mathematical Methods for Physicists 7e.
Recommended books and references (scientific journals, reports…)	H. J. Weber and G. B. Arfken, "Essential Mathematical Methods for Physicists", Academic Press, 2003.
Electronic References, Websites	طرق في الرياضيات التطبيقية تأليف الدكتور باسل يعقوب يوسف ، جامعة البصرة – العراق، 9191.

Course Description Form

1. Course Name:	
Physics of Radiotherapy	
2. Course Code:	
PHY-414	
3. Semester / Year:2025-2026	
1st semester /2025−2026	
4. Description Preparation Date:	
25-9-2025	
5. Available Attendance Forms:	
Actual Attendance	
6. Number of Credit Hours (Total) / Number of Units (Total)	
60 hours, 2Theortical +2 Practical hours per week * 15 weeks / 3 units	
7. Course administrator's name (mention all, if more than one name)	
Name: Dr. Shaimaa Hussien Shahad Email: shaima@uowasit.edu.iq	
8. Course Objectives	
Course Objectives	1. This course provides the basics of radiotherapy physics and the components of the imaging equipment used through lectures and seminars. 2. The course presents the physical theories and principles of radiotherapy physics, the main components of imaging devices used in radiotherapy, imaging agents and their effect in improving image quality, along with the main

	pulse sequences used in imaging and their applications with an emphasis on safety considerations, data acquisition mechanisms, 3. The course explains how to process images. The basic details are an explanation of the A summary of the fluoroscopic radiography device, image intensifiers, image quality, computed tomography and magnetic resonance imaging devices.

9. Teaching and Learning Strategies

Strategy	1. Interactive lectures: Use lectures to introduce basic and complex concepts related to the physics of radiation therapy, while encouraging students to ask questions and participate in discussions. 2. Use of multimedia and technology 3. Evaluation and feedback: Continuous evaluation of students through tests, reports, and presentations while providing constructive feedback that helps improve the learning process. 4. Self-learning and research: Encouraging students to do self-research and explore the latest developments in the field of radiation therapy, which helps in developing research skills and continuous learning. 5- Use of educational technology (data show) Oral discussions

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Knowledge and understanding definitions	definitions	Method of Lecture, discussion and brainstorm	QUIZ. And EXAM
2	2	Knowledge and understanding Classification of radiation	Classification of radiation	Method of Lecture, discussion and brainstorm	QUIZ. and EXAM
3	2	Knowledge and understanding x ray production	X ray production	Method of Lecture, discussion and brainstorm	QUIZ. and . EXAM
4	2	Knowledge and understanding X ray properties	X ray properties	Method of Lecture, discussion and brainstorm	QUIZ. And EXAM
5	2	Knowledge and understanding x ray	X ray tube, problems	Method of Lecture, discussion and	QUIZ. and

		tubes		brainstorm	EXAM
6	2		Exam 1	Method of Lecture, discussion and brainstorm	QUIZ. And EXAM
7	2	Knowledge and understanding Measurement of radiation dose	Measurement of radiation dose	Method of Lecture, discussion and brainstorm	QUIZ. and EXAM
8	2	Knowledge and understanding fluence	fluence	Method of Lecture, discussion and brainstorm	QUIZ. and EXAM
9	2	Knowledge and understanding Method of dose	Dose types	Method of Lecture, discussion and brainstorm	QUIZ. and EXAM
10	2	Knowledge and understanding Radiation therapy devices	Radiation therapy devices	Method of Lecture, discussion and brainstorm	QUIZ. And EXAM
11	2	Knowledge and understanding Dose distribution and scatter analysis	Dose distribution and scatter analysis	Method of Lecture, discussion and brainstorm	QUIZ. and EXAM
12	2	Knowledge and understanding Dose distribution and scatter analysis	Dose distribution and scatter analysis	Method of Lecture, discussion and brainstorm	QUIZ. and EXAM
13	2	Knowledge and understanding Radiation safety	Radiation safety	Method of Lecture, discussion and brainstorm	QUIZ. and EXAM
14	2	Knowledge and understanding Scatter analysis	Scatter analysis	Method of Lecture, discussion and brainstorm	QUIZ. and EXAM
15	2	Knowledge and understanding problems	Solved prpblems	Method of Lecture, discussion and brainstorm	QUIZ. and EXAM

16	**2**	**Exam**			

11. Course Evaluation

Distributing the score out of 100 according to the tasks assigned to the student:

Experiment reports and quizzes 6
Laboratory exam 6
Monthly Exam 28

Final Exam 60

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	
Main references (sources)	Nuclear Radiation Physics,by R. Lapp and H. Andrews, Prentic-Hall(1972)
Recommended books and references (scientific journals, reports…)	The physics of Radiation Therapy ,3rd adition, " Faiz M. Khan,2003
Electronic References, Websites	**https://ucrfisicamedica.files.wordpress.com/2010/10/phys-of-radiation-therapy-3-edicion-khan.pdf** https://secwww.jhuapl.edu/techdigest/Content/techdigest/pdf/V04-N01/04-01-Grant.pdf

Course Description Form

1. Course Name:
Radiation Biology
2. Course Code:
PHY-412
3. Semester / Year: 2025-2026

1st semester /2025-2026
4. Description Preparation Date:
25/9/2025
5. Available Attendance Forms:
Actual Attendance
6. Number of Credit Hours (Total) / Number of Units (Total): 2
60 hours, 2Theortical +2 Practical hours per week * 15 weeks / 3 units
7. Course administrator's name (mention all, if more than one name)
Name: Dr.Zeina Abbass Salman Email: zsalman@uowasit.edu.iq

8. Course Objectives	
Course Objectives	• **Establish an in-depth idea of the mechanistic routes through which ionizing radiations cause damage to DNA, proteins, and other cell structures.** • **Identify the direct and indirect action of radiation on every type of biological molecule and explain the mechanisms.** • **Describe the different cellular repair processes and evaluate their essential effect on regulating the radiation response.** • **Statistically analyze cell survival curves to determine dose-response relationships with accuracy.** • **Get an in-depth knowledge about the cell cycle and its role on radiosensitivity.** • **Explain the oxygen effect and explain its clinical relevance.** • **Learn the concepts of linear energy transfer (LET) and relative biological effectiveness (RBE).** • **Describe radiation responses specific to tissue and explain the concept of radiosensitivity.** • **Enable students to use this information in their future fields of work, such as the fields of scientific research and practical experiences, in a way that contributes to serving society and developing the reality of education in it.**

9. Teaching and Learning Strategies	
Strategy	• **Using presentation, participation, problem solving, and discussion.** • **Using modern technology for education and encouraging students to participate in group discussions.** • **Encouraging students to self-learn and form groups to discuss scientific material.**

10. Course Structure					
Week	**Hours**	**Required Learning Outcomes**	**Unit or subject name**	**Learning method**	**Evaluation method**
1	2	Introduction on radiation biology, radiation types, doses and exposure, relationship between physics and biological effects	Introduction to Radiation Biology	Lecture+ Discussion	Exams
2	2	Water radiolysis and reactive oxygen species (ROS), direct vs. indirect effects of radiation, chemical pathways of radiation damage, role of oxygen and chemical modifiers, time scales of radiation-induced events (10^{-18} to 10^{2} seconds)	Radiation Chemistry and Free Radicals	=	=
3	2	DNA structure: base pairs, double helix, chromatin organization, types of DNA lesions: base damage, single-strand breaks (SSB), double-strand breaks (DSB), DNA damage complexity and clustered damage, measurement techniques for DNA damage, radiation quality and DNA damage patterns	DNA Structure and Radiation Damage	Lecture	=
4	2	Base excision repair (BER), Nucleotide excision repair (NER), Non-homologous end joining (NHEJ), Homologous recombination repair (HRR), Mismatch repair and other pathways, Factors affecting repair: oxygen, temperature, repair capacity, Repair kinetics and fidelity	DNA Repair Mechanisms	Lecture+ Discussion	=
5	2	Cell cycle phases: G1, S, G2, M, radiosensitivity variations through the cell cycle, cell cycle checkpoints and their role in radiation response, therapeutic implications of cell cycle effects	Cell Cycle and Radiosensitivity	=	=
6	2	Oxygen enhancement ratio (OER), mechanisms of oxygen effect: fixation hypothesis, tumor hypoxia: chronic vs. acute, reoxygenation during fractionated therapy, hypoxic cell radiosensitizers, hypoxia imaging and clinical implications	Oxygen Effect and Hypoxia	Lecture	=
7	2	Definition and measurement of LET, relationship between LET	Linear Energy	=	=

		and biological effects, relative biological effectiveness (RBE), track structure and microdosimetry, high-LET radiation: neutrons, protons, heavy ions, clinical applications of high-LET therapy	Transfer (LET) and RBE		
8	2	Radiation-induced genomic instability, adaptive response and hormesis, acute radiation syndrome: hematopoietic, gastrointestinal, cerebrovascular	Cellular Responses and Radiation Syndromes	=	=
9	2	Hierarchical tissue organization, rapidly vs. slowly proliferating tissues, acute responding tissues (skin, mucosa, bone marrow, GI tract), late responding tissues (lung, kidney, spinal cord, brain), volume effects in normal tissue response	Tissue and Organ Response to Radiation	Lecture+ Discussion	=
10	2	Repair, Redistribution, Repopulation, and Reoxygenation	The Four R's of Radiobiology	=	=
11	2	Rationale for fractionation, conventional vs. hypofractionation vs. hyperfractionation, biological effective dose (BED) calculations, EQD2 (equivalent dose in 2 Gy fractions)	Fractionation and Clinical Radiobiology	=	=
12	2	Radiation-induced carcinogenesis mechanisms, latent period and dose-response relationships, epidemiological studies: atomic bomb survivors, medical exposures, organ-specific cancer risks, age and gender dependencies, linear no-threshold (LNT) model vs. alternatives, hereditary effects and genetic risk, risk estimation and ICRP recommendations	Carcinogenesis and Stochastic Effects	=	=
13	2	High dose per fraction effects and Vascular damage and immune response	Special Topics in Radiation Biology	=	=
14	2	Radiation effects on immune system, combining radiation with immunotherapy, radiosensitizers and radioprotectors	Special Topics in Radiation Biology	=	=
15	2	Comprehensive case studies integrating all concepts, clinical applications discussion, final examination review and discussion	Review, Integration, and Assessment	=	=

11. Course Evaluation	
Exams which include quizzes, midterms, and finals	
12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	3) Hall, E.J. & Giaccia, A.J. (2019). *Radiobiology for the Radiologist* (8th Edition). Wolters Kluwer. 4) Joiner, M.C. & van der Kogel, A.J. (Eds.) (2018). *Basic Clinical Radiobiology* (5th Edition). CRC Press. 5) Steel, G.G. (2002). *Basic Clinical Radiobiology* (3rd Edition). CRC Press.
Main references (sources)	3) Alpen, E.L. (1998). *Radiation Biophysics* (2nd Edition). Academic Press. 4) Hendry, J.H. & Lord, B.I. (Eds.) (1995). *Radiation Toxicology: Bone Marrow and Leukaemia*. Taylor & Francis. 5) Tubiana, M., Dutreix, J., & Wambersie, A. (1990). *Introduction to Radiobiology*. Taylor & Francis.
Recommended books and references (scientific journals, reports…)	1) Bristow, R.G. & Hill, R.P. (2019). *Molecular Radiation Biology* in *The Basic Science of Oncology* (5th Edition). McGraw-Hill. 2) Maity, A., Kao, G.D., & Muschel, R.J. (Eds.) (2009). *Radiation Oncology: A Question-Based Review* (2nd Edition). Lippincott Williams & Wilkins. 3) Dale, R.G. & Jones, B. (Eds.) (2007). *Radiobiological Modelling in Radiation Oncology*. British Institute of Radiology.
Electronic References, Websites	Internet sites specialized in teaching and explaining radiation biologyبيا and its concepts

Course Description Form

1. Course Name:
Physics of Nuclear Medicine
2. Course Code:
PHY-413

3. Semester / Year: Fourth Year
1st Semester / 2025 – 2026
4. Description Preparation Date:
2025-8-1
5. Available Attendance Forms:
Presence
6. Number of Credit Hours (Total) / Number of Units (Total)
4 HOURS (2 Hours Theory) and (2 Hours Practical)
7. Course administrator's name (Mention all, if more than one name)
Name: Assit.Prof. Dr. Maitham Salman Amana Email: malsalem@uowasit.edu.iq

8. Course Objectives

Course Objectives	• Studying the types of ionizing radiation, their physical properties, and their interaction with matter and living tissues. • Understanding the mechanisms of radioactive decay, radioactivity, and the laws of nuclear decay. • Understanding the operating principles of various radiation detectors used in nuclear medicine. • Studying the fundamentals of imaging in nuclear medicine (Gamma Camera, SPECT, PET). • Comprehending the physical principles of radioisotope therapy and its clinical applications. • Learning methods for measuring and calculating radiation doses. • Familiarity with radiation safety and protection protocols in laboratories and medical facilities. •Developing the ability to analyze radiation data and interpret results practically.

9. Teaching and Learning Strategies

Strategy	1. **Preparing students with a high level of understanding, awareness, and comprehension of how medical devices work, along with an understanding of their physical mechanism and how to use the appropriate device for each medical condition.**

10. Course Structure

Week	Hours	Required learning outcomes	Unit or subject name (Theoretical)	Learning method	Evaluation method
1	2	**Mentioned within previous point according to the contents**	Fundamental physical constants	Presentation – Discussion	Written and oral test
2	2	=	Physical quantities and units	Presentation – Discussion	Written and oral test
3	2	=	Classification of radiation	Presentation – Discussion	Written and oral test
4	2	=	Classification of ionizing radiation	Presentation – Discussion	Written and oral test
5	2	=	X-Rays .The Production of X-Rays	Presentation – Discussion	Written and oral test
6	2	=	Basic Definitions for Atomic Structure	Presentation – Discussion	Written and oral test
7	2	=	Basic Definitions for Nuclear Structure	Presentation – Discussion	Written and oral test
8	2	=	Q-Value of Nuclear Processes	Presentation – Discussion	Written and oral test
9	2	=	Mass Defect & Binding Energy	Presentation – Discussion	Written and oral test

10	2	=	Nuclear Medicine Therapy	Presentation – Discussion	Written and oral test
11	2	=	Physical Basis of Nuclear Medicine Therapy	Presentation – Discussion	Written and oral test
12	2	=	Diagnostic Methods Using Nuclear Technologies	Presentation – Discussion	Written and oral test
13	2	=	Nuclear Measurement Systems	Presentation – Discussion	Written and oral test
14	2	=	Advanced nuclear diagnostic devices	=	Written and oral test
15	2	=	High-Purity Detector	=	Written and oral test
16	2	=	Exam.		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.

Course	Theoretical			Practical			Final - Exam
	First Exam.	**second** Exam.	**Quizzes**	**First Exam.**	**second** Exam.	**Quizzes**	
1nd	20 Theoretical Exams 25	20	5	10 Practical aspect 15	10	5	60

12.Learning and Teaching Resources

Powsner, R. A., Palmer, M. R., & Powsner, E. R. (2021). *Essentials of nuclear medicine physics,*	Main references (sources)
instrumentation, and radiation biology. John Wiley & Sons. Vetter, R. J., & Stoeva, M. S. (Eds.). (2016). *Radiation*	Main references (sources)
protection in medical imaging and radiation oncology (Vol. 34). Boca Raton, FL: CRC Press.	Recommended supporting books and references (scientific journals, reports...)

Course Description Form

1. Course Name:
Medical Instrumentation I
2. Course Code:
PHY-411
3. Semester / Year:
1st Semester / 2025 – 2026

4. Description Preparation Date:

25/9/2025

5. Available Attendance Forms:

Presence

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

(2 Hours Theory) and (2 Hours Practical)/3 unit

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

Name: Asst.Prof. Dr. waleed kamil abdulkadhim
Email: waleed.k@uowasit.edu.iq

8. Course Objectives

Course Objectives	Providing students with scientific concepts in the fields of fundamentals of MEDICAL INSTRUMENTATION and its applications as follows: 5. • Learning the skill of using medical devices 6. 7. • Developing a technician capable of understanding the physical mechanisms of how medical devices work 8. • Understanding the skill and diagnosis of the appropriate device for each medical condition

9. Teaching and Learning Strategies

Strategy	1. **Preparing students with a high level of understanding, awareness, and comprehension of how medical devices work, along with an understanding of their physical mechanism and how to use the appropriate device for each medical condition.**

10. Course Structure

Week	Hours	Required learning outcomes	Unit or subject name (Theoretical)	Learning method (Practical)	Evaluation method
1	2	Mentioned within previous point according to the contents	**INTRODUCTION** **A medical device**	What it is and how it works	Daily quizzes, live questioning and discussion
2	2	=	blood-pressure	What it is and how it works	Daily quizzes, live questioning and discussion
3	2	=	Hot air ovens	What it is and how it works	Daily quizzes, live questioning and discussion
4	2	=	First Exam.	Present	Daily quizzes, live questioning and discussion
5	2	=	-water bath	What it is and how it works	Daily quizzes, live questioning and discussion
6	2	=	Wax bath	What it is and how it works	Exam.
7	2	=	Autoclave	What it is and how it works	Daily quizzes, live questioning and discussion
8	2	=	Centrifuges	What it is and how it works	Daily quizzes, live questioning and

					discussion
9	2	=	**Second exam.**	Present	Daily quizzes, live questioning and discussion
10	2	=	**Microscope**	What it is and how it works	Daily quizzes, live questioning and discussion
11	2	=	**Incubator (Culture)**	What it is and how it works	Daily quizzes, live questioning and discussion
12	2	=	**Fume Hood**	What it is and how it works	Daily quizzes, live questioning and discussion
13	2	=	**Final practical exams + final theory exams**	Present	Daily quizzes, live questioning and discussion
14	2	=	**Final practical exams + final theory exams**	=	Daily quizzes, live questioning and discussion
15	2	=	**Final practical exams + final theory exams**	=	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.

Course	Theoretical			Practical			Final - Exam
	First Exam.	First Exam.	Quizzes	First Exam.	First Exam.	Quizzes	
1nd	12	12	4	4	4	4	60

12.Learning and Teaching Resources

Required Textbooks (Curricular Books, if any)	Non
Main References (Sources)	1. Medical Instrumentation Application and Design, 4th Edition (John G. Webster)
Recommended Books and References (Scientific Journals, Reports...)	1-Principles of Biomedical Instrumentation (Andrew G. Webb) 2- Medical Instruments and Devices (Steven Schreiner)
Electronic References, Websites	https://www.medicainstrument.com

Course Description Form

1. Course Name:
Medical Instrumentation II
2. Course Code:
PHY-421
3. Semester / Year:

2nd Semester / 2025 – 2026

4. Description Preparation Date:

1/2/2026

5. Available Attendance Forms:

Presence

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

(2 Hours Theory) and (2 Hours Practical)/3 unit

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

Name: Asst.Prof. Dr. waleed kamil abdulkadhim
Email: waleed.k@uowasit.edu.iq

8. Course Objectives

Course Objectives	Providing students with scientific concepts in the fields of fundamentals of MEDICAL INSTRUMENTATION and its applications as follows: 9. • Learning the skill of using medical devices 10. • Developing a technician capable of understanding the physical mechanisms of how medical devices work 11. • Understanding the skill and diagnosis of the appropriate device for each medical condition

9. Teaching and Learning Strategies

Strategy	2. **Preparing students with a high level of understanding, awareness, and comprehension of how medical devices work, along with an understanding of their physical mechanism and how to use the appropriate device for each medical condition.**

10. Course Structure

Week	Hours	Required learning outcomes	Unit or subject name (Theoretical)	Learning method (Practical)	Evaluation method
1	2	Mentioned within previous point according to the contents	**Ultrasound**	What it is and how it works	Daily quizzes, live questioning and discussion
2	2	=	**Centrifuges**	What it is and how it works	Daily quizzes, live questioning and discussion
3	2	=	**Use the X-ray**	What it is and how it works	Daily quizzes, live questioning and discussion
4	2	=	**First Exam.**	Present	Daily quizzes, live questioning and discussion
5	2	=	**Microscope**	What it is and how it works	Daily quizzes, live questioning and discussion
6	2	=	**Use the laser in medicine**	What it is and how it works	Exam.
7	2	=	**Use the CT-Scan**	What it is and how it works	Daily quizzes, live questioning and discussion
8	2		**Second exam.**	What it is and	Daily quizzes,

		=		how it works	live questioning and discussion
9	2	=	**Use the Magnetic Resonance Imaging (MRI)**	Present	Daily quizzes, live questioning and discussion
10	2	=	**Fume Hood**	What it is and how it works	Daily quizzes, live questioning and discussion
11	2	=	**Incubator (Culture)**	What it is and how it works	Daily quizzes, live questioning and discussion
12	2	=	**Use the Fume Hood**	What it is and how it works	Daily quizzes, live questioning and discussion
13	2	=	**Final practical exams + final theory exams**	Present	Daily quizzes, live questioning and discussion
14	2	=	**Final practical exams + final theory exams**	=	Daily quizzes, live questioning and discussion
15	2	=	**Final practical exams + final theory exams**	=	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.

Course	Theoretical			Practical			Final - Exam
	First Exam.	First Exam.	Quizzes	First Exam.	First Exam.	Quizzes	
1nd	12	12	4	4	4	4	60

12.Learning and Teaching Resources

Required Textbooks (Curricular Books, if any)	Non
Main References (Sources)	2. Medical Instrumentation Application and Design, 4th Edition (John G. Webster)
Recommended Books and References (Scientific Journals, Reports...)	1-Principles of Biomedical Instrumentation (Andrew G. Webb) 2- Medical Instruments and Devices (Steven Schreiner)
Electronic References, Websites	https://www.medicainstrument.com

Course Description Form

1. Course Name:
Bio Statistics
2. Course Code Department of Physical Sciences - Fourth Stage Medical physic

PHY-424	
3. Semester / Year	
Second Semester(2025/2026)	
4. Description Preparation Date:.	
1/2/2026	
5. Available Attendance Forms	
Actual Attendance	
6. Number of Credit Hours (Total) / Number of Units (Total)	
30 hours, 2 hours per week * 15 weeks / 2 units	
7. Course administrator's name (mention all, if more than one name)	
Name:D.r Nadia Naeema **Email: @uowasit.edu.iq**	
8. Course Objectives	
Course Objectives	**- It makes the student familiar and aware of the most important characteristics of the statistics course.** **Especially the vital part of it, which is concerned with statistical equations** **For biological specializations, which give the amount of significant changes for the extracted values.** **- Enabling the student to understand the principles of statistics.** **- Mastering applied methods in statistics.** **- Enabling the student to use statistical methods and standards theoretically and scientifically.** **- Identifying the basic components of the statistics curriculum.** **- Learn about methods of applying statistics using statistical programs on the computer.** **- Identify statistical metrics.** **- The ability to analyze life phenomena statistically.**
9. Teaching and Learning Strategies	
Strategy	-Group discussions and assignments -Creating an atmosphere of competition among students and treating individual differences using appropriate educational methods -Research groups - nested discussion circles. - Teaching methods include the use of educational technology - Encouraging students to self-learn.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	(2 **Th)**	Definition of statistics and biostatistics with examples and Population and samples and methods of sampling	**Introduction to statistics**	**Deliverance - discussion**	**General questions and discussion**
2	(2 **Th)**	Definition of statistics and biostatistics with examples and Population and samples and methods of sampling	Introduction to statistics	**Deliverance - discussion**	**General questions and discussion**
3	(2 **Th)**	Central Tendenc measurements (Mean, Median, and Mode)	Central Tendency measurements	**Deliverance - discussion**	**General questions and discussion**
4	(2 **Th)**	Central Tendenc measurements (Mean, Median, and Mode)	Central Tendency measurements	**Deliverance - discussion**	**General questions and discussion**
5	(2 **Th)**	Central Tendenc measurements (Mean, Median, and Mode)	Central Tendency measurements	**Deliverance - discussion**	**General questions and discussion**
6	(2 **Th)**	Measurements o variations (Mean deviation standard Deviati and Variance)	Measurements of variations	**Deliverance - discussion**	**General questions and discussion**
7	(2 **Th)**	Measurements o variations (Mean deviation standard Deviati and Variance)	Measurements of variations	**Deliverance - discussion**	**General questions and discussion**
8	(2 **Th)**	Elementary probability rules And Random variables	Probability		**General questions and discussion**
9	(2 **Th)**	Elementary probability rules And Random variables	Probability	**Deliverance - discussion**	**General questions and discussion**
10	(2 **Th)**	Elementary	Probability	**Deliverance**	**General**

		probability rules And Random variables		**- discussion**	**questions and discussion**
11	(2 **Th)**	Elementary probability rules And Random variables	Probability	**Deliverance - discussion**	**General questions and discussion**
12	(2 **Th)**	Statistical Distributions (Normal Distribution and Binomial Distribution) an test and Chi squa test	Statistical Distributions	**Deliverance - discussion**	**General questions and discussion**
13	(2 **Th)**	Statistical Distributions (Normal Distribution and Binomial Distribution) an test and Chi squa test	Statistical Distributions	Deliverance - discussion	General questions and discussion
14	(2 **Th)**	Statistical Distributions (Normal Distribution and Binomial Distribution) an test and Chi squa test	Statistical Distributions	Deliverance - discussion	General questions and discussion
15	(2 **h)**	Statistical Distributions (Normal Distribution and Binomial Distribution) an test and Chi squa test	Statistical Distributions	Deliverance - discussion	General questions and discussion
16	(2h)		**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

Course	Daily preparation, daily and oral exams ,Daily assignments	Exam	Final -
2nd	10	30	40

12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	Donald N. Forthofer, Eun Sul Lee, Introduction to Biostatistics: A Guide to Design, Analysis, and Discovery, Academi Press INC. (1995)
Main references (sources)	كتاب مقدمة في الإحصاء الحياتي للعلوم الحياتية ترجمه د. احمد الخياط واخرون
Recommended books and references (scientific journals, reports…)	كتاب الإحصاء الحياتي لمؤلفه عبد الخالق عبد الجبار النقيب
Electronic References, Websites	

Course Description Form

1. Course Name:
Electromagnetics Theory
2. Course Code: /
PHY-425
3. Semester / Year:

2025–2026 – 2 nd Semester
4. Description Preparation Date:
1–2–2026
5. Available Attendance Forms:
Actual Attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
30 hours, 2 hours per week * 15 weeks / 2 units
7. Course administrator's name (mention all, if more than one name)
Name: Dr. Shaimaa Hussien Shahad **Email: shaima@uowasit.edu.iq**
8. Course Objectives

Course Objectives	• **Providing Students with knowledge of the principles of electromagn theory** • **– Developing positive attitudes towards electromagnetic theory** • **– Identifying research methods in electromagnetic theory** • **– Identify the basic concepts in electromagnetic theory** • **– Identify the basic trends in electromagnetic theory** • **– Identifying the objectives of electromagnetic theory** • **– Forming Students' knowledge of the historical development of the conc of electromagnetic theory** • **– Identify the components of the basic properties of electromagnetic theor** • **– Learn about the basic information of vector algebra and the basic laws vectors** • **– Acquire theoretical knowledge in the basic laws of electrostatics** • **– Identify the Poisson and Laplace equations** • **– Evaluating the performance characteristics of electromagnetic theory** • **– Acquiring skills in the topics of magnetic theory and its applications**

9. Teaching and Learning Strategies	
Strategy	**- Method of Lecture, discussion and brainstorm** **- Teaching methods include the use of educational technology** **- Encouraging students to self-learn**

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Knowledge and understanding the	Vector analysis vector algebra	Method of Lecture,	QUIZ. and EXAM

		Vector analysis and vector algebra		discussion and brainstorm	
2	2	Knowledge and understanding Gradient ,divergence ,curl	Gradient ,divergence ,curl	Method of Lecture, discussion and brainstorm	QUIZ. and EXAM
3	2	Knowledge and understanding Electrostatics :coulomb laws	Electrostatics :coulomb laws	Method of Lecture, discussion and brainstorm	QUIZ. and EXAM
4	2	Knowledge and understanding Electric field ,potential	Electric field ,potential	Method of Lecture, discussion and brainstorm	QUIZ. and EXAM
5	2	Knowledge and understanding Conductors , insulators	Conductors , insulators	Method of Lecture, discussion and brainstorm	QUIZ. and EXAM
6	2	Knowledge and understanding Gauss's law, electric dipole	Gauss's law, electric dipole	Method of Lecture, discussion and brainstorm	QUIZ. and EXAM
7	2	Knowledge and understanding Poisson's eq. ,Laplace eq.	Poisson's eq. ,Laplace eq.	Method of Lecture, discussion and brainstorm	QUIZ. and EXAM
8	2	Knowledge and understanding Uniqueness theorem	Uniqueness theorem	Method of Lecture, discussion and brainstorm	QUIZ. and EXAM
9	2	Knowledge and understanding Method of image	Method of image	Method of Lecture, discussion and brainstorm	QUIZ. and EXAM
10	2	Knowledge and understanding Resistance and capacitance	Resistance and capacitance	Method of Lecture, discussion and brainstorm	QUIZ. and EXAM
11	2	Knowledge and understanding Electrostatics field in dielectric	Electrostatics field in dielectric	Method of Lecture, discussion and brainstorm	QUIZ. and EXAM
12	2	Knowledge and understanding Electrostatics energy	Electrostatics energy	Method of Lecture, discussion and brainstorm	QUIZ. and EXAM
13	2	Knowledge and understanding Energy density ,	Energy density ,	Method of Lecture, discussion and brainstorm	QUIZ. and EXAM
14	2	Knowledge and understanding Convection and conduction current	Convection and conduction current	Method of Lecture, discussion and brainstorm	QUIZ. and EXAM
15	2	Knowledge and understanding Current density ,eq. of continuity	Current density ,eq. of continuity	Method of Lecture, discussion and brainstorm	QUIZ. and EXAM

16	2	Exam	Exam		

11. Course Evaluation	
13. Follow up daily attendance. 14. Daily Quiz 15. Monthly Exam 16. Final exam 17. grades for participation to solve questions during the lecture	
18. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	1. Sadiku, Matthew N. O. Elements of Electromagnetics. 6th ed. New York: Oxford University Press, 2014. 2. Reitz, John R., Frederick J. Milford, and Robert W. Christy. Foundations of Electromagnetic Theory. 4th ed. Reading, MA: Addison-Wesley Publishing Company, 1993. 3. Edminister, Joseph A. Schaum's Outline Theory and Problems of Electromagnet 2nd ed. New York: McGraw-Hill, 2002.
Main references (sources)	
Recommended books and references (scientific journals, reports…)	
Electronic References, Websites	

Course Description Form

1. Course Name:
Medical image processing
2. Course Code:
PHY-422
3. Semester / Year: 2025-2026
2nd semester/2025-2026
4. Description Preparation Date:
1/2/2026
5. Available Attendance Forms
Actual Attendance
6. Number of Credit Hours (Total) / Number of Units (Total): 2
60 hours, 2Theortical +2 Practical hours per week * 15 weeks / 3 units
7. Course administrator's name (mention all, if more than one name)

Name: Assit.prof.Dr Mutasim Ibrahim Malik Email: mutasim@uowasit.edu.iq	
8. Course Objectives	
Course Objectives	**The practical objectives of teaching mathematics to students encompass developing mental skills and enhancing the applied understanding of medical image processing concepts in daily life. These objectives can be summarized as follows:** **1. Developing logical and analytical thinking: image processing helps students cultivate critical thinking and structured problem-solving skills.** **2. Enhancing problem-solving skills: Students learn how to analyze problems, formulate hypotheses, and choose appropriate strategies to reach solutions.** **3. Applying image processing concepts to everyday life: Such as managing budgets, measuring distances, calculating bank interest, and analyzing data.** **4. Supporting other disciplines: medical image processing is fundamental in sciences, engineering, economics, and various technical fields.** **5. Developing abstract thinking skills: Enabling students to work with numbers, symbols, and complex mathematical relationships.** **6. Promoting accuracy and discipline: Mathematics requires precision in calculations and attention to detail.** **7. Encouraging innovation and creativity: By developing new strategies for solving problems and creating novel image processing methods.** **8. Improving mathematical programming communication skills: Helping students express ideas using mathematical terms, graphs, and tables.** **9. Enhancing the ability to predict and make decisions: Using statistics, probabilities, and mathematical modeling for forecasting and informed decision-making.** **10. Preparing students for the job market: Many careers require strong numerical and analytical skills, especially in STEM fields**

	(Science, Technology, Engineering, and Mathematics).

9. Teaching and Learning Strategies

Strategy	• **Using presentation, participation, problem solving, and discussion.** • **Using modern technology for education and encouraging students to participate in group discussions.** • **Encouraging students to self-learn and form groups to discuss scientific material.**

10. Course Structure

Week	Hours	Unit or subject name	Required Learning Outcomes	Learning method	Evaluation method
1	2	Introduction to Medical Image Processing • Concept of medical images • Role of image processing in medical physics • Types of medical images: X-ray, CT, MRI, Ultrasound, Nuclear Medicine	Understand the fundamental principles of physics applied in medicine, including radiation physics, nuclear physics, and medical imaging physics. Explain the physical basis of major diagnostic imaging modalities, such as X-ray, CT, MRI, Ultrasound, and Nuclear Medicine. Analyze radiation interactions with matter and describe their biological effects on human tissues. Apply dosimetry concepts to measure, calculate, and evaluate radiation dose in diagnostic and therapeutic procedures. Understand the principles of radiation protection and safety standards in clinical environments. Interpret medical	Lecture + Discussion	Exams
2	2	Fundamentals of Digital Images • Digital image representation • Pixels and gray-level resolution • Spatial and intensity resolution • Noise in medical images		=	=
3	2	Medical Image Acquisition • Principles of image formation • Characteristics of medical imaging systems • Sources of distortion and noise		Lecture	=
4	2	Image Enhancement • Contrast enhancement techniques • Histogram analysis and equalization • Enhancement of low-		Lecture + Discussion	=

		quality medical images	images using physical image quality parameters, including resolution, contrast, SNR, and CNR. Apply basic image processing techniques in medical imaging using computational tools (e.g., MATLAB). Evaluate the performance of medical imaging systems using physical and quantitative metrics. Understand the role of DICOM and PACS systems in medical image storage and communication. Develop problem-solving skills for clinical and research applications in medical physics.		
5	2	Image Filtering and Noise Reduction • Spatial domain filtering • Mean and median filters • Frequency domain filtering		=	=
6	2	Frequency Domain Analysis • Two-dimensional Fourier Transform • Spatial vs frequency domain interpretation • Medical applications of frequency analysis		Lecture	=
7	2	Edge Detection and Feature Identification • Edge detection operators: Sobel, Prewitt, Canny • Clinical importance of edge detection		=	=
8	2	Medical Image Segmentation • Thresholding techniques • Region-based and edge-based segmentation • Applications in organ and tumor delineation		=	=
9	2	Image Registration • Rigid and non-rigid registration • Clinical applications of image registration		Lecture + Discussion	=
10	2	10. Feature Extraction • Geometric and statistical features • Role of features in medical image analysis		=	=
11	2	Image Quality Assessment • Image quality metrics (SNR, CNR) • Physical measures of image quality		=	=
12	2	Medical Image Storage and Communication • DICOM standard • PACS systems		=	=
13	2	Practical Applications • MATLAB-based medical		=	=

11. Course Evaluation	
Exams which include quizzes, midterms, and finals	
12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	Gonzalez, R. C., & Woods, R. E. Digital Image Processing (3rd ed.). Pearson. Available free via academic repositories: https://homepages.inf.ed.ac.uk/rbf/HIPR
Main references (sources)	Prince, J. L., & Links, J. M. Medical Imaging Signals and Systems. Pearson. Free lecture notes and chapters available at: https://engineering.jhu.edu/cism/
	Nishikawa, R. M. Medical Imaging Physics. Free educational resources and lecture notes available at: https://www.aapm.org/education

Course Description Form

1. Course Name:	
Nanoscience in Medicine	
2. Course Code:	
PHY-428	
3. Semester / Year:	
Second semester / 4th year 2025-2024	
4. Description Preparation Date:	
1/2/2026	
5. Available Attendance Forms:	
Attendance in class	
6. Number of Credit Hours (Total) / Number of Units (Total)	
60 hours, 2Theortical +2 Practical hours per week * 15 weeks / 3 units	
7. Course administrator's name (mention all, if more than one name)	
Name: Asst. Prof. Dr. Mahdi Ahmed Mohammed Email: mahmed@uowasit.edu.iq	
8. Course Objectives	
Course Objectives	**12. Identify the nano phenomenon in relation to the dimensions of materials** **13. Know nanomaterial approaches** **14. To have acknowledge about the physical properties of nanoscale materials**

	15. Identify its most important applications in medicine

9. Teaching and Learning Strategies

Strategy	**1- Enable the student to know the basics of nanoscience** **2- Knowing the difference in the physical properties of nanomaterials from bulk material** **3- Enabling the student to understand nanomaterial approaches and characterizations** **4- How to use nanomaterials in different fields of medicine according to their physical properti** **5- Knowing the recent nanotechnologies in medicine.**

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Study the introduction of nanoscience and the classification of nanomaterials	Introduction to Nanophysics and Nanoscience	Lecture + discussion	Tests
2	2	Studying the effect of the nanoscale on surface area and quantum effects	Significance of nanoscale: Surface Effects Quantum Effects	Lecture + discussion	Tests
3	2	Study the optical properties of materials that have a surface Plasmon resonances phenomenon. Understand this property to be used in medicine	Properties of Nanomaterials 1- Optical Properties: a- Surface Plasmons, ar its application in medicine	Lecture + discussion	Tests
4	2	Study the optical properties of materials that are under the effect of quantum confinement. Understand this property to be used in medicine	b-Quantum confinement effec and its application in medicin	Lecture + discussion	Tests
5	2	Study the heating effect on the melting point of nanoparticles	2-Thermodynamic properties	Lecture + discussion	Tests
6	2	Study the magnetic properties of bulk materials	Magnetic Properties P.1	Lecture + discussion	Tests
7	2	Study the magnetic properties of nanomaterials. Understand this property to be used in medicine	Magnetic Properties P.2, and their application in medicine	Lecture + discussion	Tests
8	2	Study the mechanical properties of nanomaterials with different shapes. Understand this property to be used in medicine	Mechanical Properties and their application in medicine	Lecture + discussion	Tests
9	2	Study the electrical properties of nanomaterials. Understand this property to be used in medicine	Electrical Properties, and Their Application in Medicine	Lecture + discussion	Tests
10	2	Learning synthesis of nanomaterials using physical, chemical, and biological methods	Synthesis of nanomaterials using physical, chemical, and biological methods.	Lecture + discussion	Tests
11	2	Study the characterizations of nanomaterials	Characterizations of nanomaterials: XRD, SEM, TEM, UV-Visible.	Lecture + discussion	Tests
12	2	Knowing some applications of nanotechnology in medicine	Applications of nanotechnology in medicine	Lecture + discussion	Tests

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			
Monthly exams	daily and oral exams	project or report	final exam
30	5	5	60

12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	
Main references (sources)	1-Nanomaterials and Nanochemistry (C. Brechignac P. Houdy M. Lahmani) 2-Nanostructured Materials and Their Applications (Stergios Logothetidis) 3-Nanophysics and Nanotechnology (Edward L. Wolf) 4-Nanotechnology Understanding Small Systems, 3rd Ed (Rogers Jesse Adams Sumita Pennathur)
Recommended books and references (scientific journals, reports…)	
Electronic References, Websites	Internet sites in general specialize in teaching a explaining nanophysics

Course Description Form

1. Course Name:	
Biophysics	
2. Course Code:	
PHY-424	
3. Semester / Year: 2025-2026	
2nd semester/4th year 2025−2026	
4. Description Preparation Date:	
1/2/2026	
5. Available Attendance Forms:	
Actual Attendance	
6. Number of Credit Hours (Total) / Number of Units (Total):	
30 hours, 2 hours per week * 15 weeks / 2 units	
7. Course administrator's name (mention all, if more than one name)	
Name: Dr.Zeina Abbass Salman Email: zsalman@uowasit.edu.iq	
8. Course Objectives	
Course Objectives	• **Provide basic understanding of the key concepts of biophysics through the application of physical principles, methods, and techniques.** • **Focus on making students able to identify physical laws and their role in biophysical phenomena and life.**

	• **Enable students to solve problems covering applications of physics in biological systems.** • **Enable students to use this information in their future fields of work, such as the fields of scientific research and practical experiences, in a way that contributes to serving society and developing the reality of education in it.**

9. Teaching and Learning Strategies

Strategy	• **Using presentation, participation, problem solving, and discussion.** • **Using modern technology for education and encouraging students to participate in group discussions.** • **Encouraging students to self-learn and form groups to discuss scientific material.**

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Understanding the biological structures	Introduction to Biological Structures	Lecture+ Discussion	Exams
2	2	Knowing and being able to define the structures and formation of biomolecules	Structures and formation of Biomolecules	=	=
3	2	Knowing the molecular structure of membranes	Molecular Structure of Membranes	Lecture	=
4	2	Understanding the fundamental concepts of thermodynamics	Fundamental Concepts of Thermodynamics	Lecture+ Discussion	=
5	2	Define the structure and function of cells	Cell Structure and Functions	=	=
6	2	Understanding the electrostatic fields in cells	Electrostatic Fields and Cells	Lecture	=
7	2	Understanding the self-assembly and stability in biological systems	Self-Assembly and Stability	=	=
8	2	Knowing DNA and its functions	DNA and its Functions	=	=
9	2	Understanding proteins and protein folding	Protein and Protein Folding	Lecture+ Discussion	=
10	2	Knowing and understanding Brownian motion of biomolecules	Brownian motion	=	=
11	2	Defining fluids and understanding their properties	Basic Properties of Fluids	=	=
12	2	Understanding the viscosity of biological fluids	Viscosity of Biological Fluids	=	=
13	2	Knowing the biomechanics of fluid behavior	Biomechanics of Fluid Behavior	=	=
14	2	Understanding the effects of electric fields on the motion of biomolecules	Electrophoresis	=	=

15	2	Knowing the difference between diffusion and osmosis and defining the osmotic pressures	Osmosis and Osmotic Pressures	=	=

11. Course Evaluation	
Exams which include quizzes, midterms, and finals	
12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	6) Biophysics by Glasser, Springer Verlag(2001) 7) Biology in Physics: Is Life Matter by K. Bogdanov, Academic Press (2000)
Main references (sources)	6) Biophysics: An Introduction by C. Sybesma, Kluwer Academic (1989) 7) Introduction to Molecular Biophysics by J. Tuszynski, CRC Press (2003
Recommended books and references (scientific journals, reports…)	
Electronic References, Websites	Internet sites specialized in teaching and explaining biophysics and its concepts

Course Description Form

1. Course Name:	
Health Physics	
2. Course Code:	
PHY-423	
3. Semester / Year:	
First / 2025-2026	
4. Description Preparation Date:	
1/2/2026	
5. Available Attendance Forms:	
Attendance/semester	
6. Number of Credit Hours (Total) / Number of Units (Total)	
30hours / 2 units	
7. Course administrator's name (mention all, if more than one name)	
Name: Associate Professor Dr .Saba Farhan Hathot Email: saaldaher@uowasit.edu.iq	
8. Course Objectives	
Course Objectives	● Preparing students scientifically, professionally, and culturally, and enabling them to know scientific facts, concepts, and theories. ● Enabling students to apply scientific methods in addressing life and professional problems and situations. ● Enabling the graduate to continue his postgraduate studies and absorb new developments and developments in the field of physical sciences and medical physics.
9. Teaching and Learning Strategies	

Strategy	• For interactive teaching and classroom discussions • Problem-based learning • Hands-on learning and laboratory experiments

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Referred to in the previous axis	Introduction to Health Physics & Radiation Basics	Presentation-discussion	Written/Oral Test
2	2	=	Radioactivity &Radiation	Presentation-discussion	Written/Oral Test
3	2	=	Photon Interaction Mechanisms (Photoelectric, Compton, Pair Production).	Presentation-discussion	Written/Oral Test
4	2	=	Photon Interaction Mechanisms (Photoelectric, Compton, Pair Production)	Presentation-discussion	Written/Oral Test
5	3	=	*Neutron Interactions & Radiation*	Presentation-discussion	Written/Oral Test
6	2	=	Linear Energy Transfer (LET) & Biological Significance	Presentation-discussion	Written/Oral Test
7	2	=	Biological Effects of Radiation (Molecular & Cellular Levels)	Presentation-discussion	Written/Oral Test
8	2	=	Initiating Mechanisms (Direct DNA Damage & Free Radicals)	Presentation-discussion	Written/Oral Test
9	2	=	Radiation Dose Quantities & Units	Presentation-discussion	Written/Oral Test
10	2	=	Cumulated Dose & Half-Life Concepts (Physical, Biological, Effective)	Presentation-discussion	Written/Oral Test
11	2	=	Internal Radiation Exposure & Biokinetics	Presentation-discussion	Written/Oral Test
12	2	=	Radiation Attenuation & Linear/Mass Attenuation Coefficient	Presentation-discussion	Written/Oral Test
13	2	=	Shielding Design & Practical Calculations	Presentation-discussion	Written/Oral Test
14	2	=	Radiation Detection Systems	Presentation-discussion	Written/Oral Test
15	2	=	Test	Presentation-discussion	Written/Oral Test
16	2	=	Test	Presentation-discussion	Written/Oral Test

11. Course Evaluation

Distributing the score out of 100 according to the tasks assigned to the student :

1- Daily preparation and activity 20

2- Daily exams, attendance and seminar 20

3- Theoretical exams 10 4- Final exam 50	
12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	.M. G. Stabin, *Radiation Protection & Dosimetry: An Introduction to Hea Physics*. New York, NY, USA: Spring 2007.
Main references (sources)	. H. Cember and T. E. Johnson, *Introduction to Health Physics*, 4th ed. New York, NY, USA: McGraw-Hill, 2009.

Practical

Course Description Form

1. Course Name:	
Medical Instrumentation I lab.	
2. Course Code:	
3. Semester / Year:	
Semester 1st / 2025 – 2026	
4. Description Preparation Date:	
4/9/2025	
5. Available Attendance Forms:	
Presence	
6. Number of Credit Hours (Total) / Number of Units (Total)	
(2 Hours Theory) and (2 Hours Practical)	
7. Course administrator's name (Mention all, if more than one name)	
Name: Asst.Prof. Dr. waleed kamil abdulkadhim Email: waleed.k@uowasit.edu.iq	
8. Course Objectives	
Course Objectives	Providing students with scientific concepts in the fields of fundamentals of MEDICAL INSTRUMENTATION and its applications as follows: 1. • Learning the skill of using medical devices 2. 3. • Developing a technician capable of understanding the physical mechanisms of how medical devices work 4. • Understanding the skill and diagnosis of the appropriate device for each medical condition
9. Teaching and Learning Strategies	
Strategy	**Preparing students with a high level of understanding, awareness, and comprehension of how medical devices work, along with an understanding of their physical mechanism and how to use the appropriate device for each medical condition.**

10. Course Structure

Week	Hours	Required learning outcomes	Unit or subject name (Theoretical)	Learning method (Practical)	Evaluation method
1	2	Mentioned within previous point according to the contents	**INTRODUCTION A medical device**	What it is and how it works	Daily quizzes, live questioning and discussion
2	2	=	**blood-pressure**	What it is and how it works	Daily quizzes, live questioning and discussion
3	2	=	**Hot air ovens**	What it is and how it works	Daily quizzes, live questioning and discussion
4	2	=	**First Exam.**	Present	Daily quizzes, live questioning and discussion
5	2	=	**water bath**	What it is and how it works	Daily quizzes, live questioning and discussion
6	2	=	**Wax bath**	What it is and how it works	Exam.
7	2	=	**Autoclave**	What it is and how it works	Daily quizzes, live questioning and discussion
8	2	=	**Centrifuges**	What it is and how it works	Daily quizzes, live questioning and discussion
9	2	=	**Second exam.**	Present	Daily quizzes, live questioning and discussion
10	2	=	**Microscope**	What it is and how it works	Daily quizzes, live questioning and discussion
11	2	=	**Incubator (Culture)**	What it is and how it works	Daily quizzes, live questioning and discussion
12	2	=	**Fume Hood**	What it is and how it works	Daily quizzes, live questioning and discussion
13	2	=	**Final practical exams + final theory exams**	Present	Daily quizzes, live questioning and discussion
14	2	=	**Final practical exams + final theory exams**	=	Daily quizzes, live questioning and discussion
15	2	=	**Final practical exams + final theory exams**	=	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.

Course	Theoretical			Practical			Final - Exam
	First Exam.	First Exam.	Quizzes	First Exam.	First Exam.	Quizzes	
1nd	12	12	4	4	4	4	60

12.Learning and Teaching Resources

Required Textbooks (Curricular Books, if any)	Non
Main References (Sources)	3. Medical Instrumentation Application and Design, 4th Edition (John G. Webster)
Recommended Books and References (Scientific Journals, Reports...)	1-Principles of Biomedical Instrumentation (Andrew G. Webb) 2- Medical Instruments and Devices (Steven Schreiner)
Electronic References, Websites	https://www.medicainstrument.com

Course Description Form

1. Course Name:

Medical Instrumentation II lab.

2. Course Code:

3. Semester / Year:

Semester 2nd / 2025 – 2026

4. Description Preparation Date:

4/1/2026

5. Available Attendance Forms:

Presence

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

(2 Hours Theory) and (2 Hours Practical)

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

Name: Asst.Prof. Dr. waleed kamil abdulkadhim
Email: waleed.k@uowasit.edu.iq

8. Course Objectives

Course Objectives	Providing students with scientific concepts in the fields of fundamentals of MEDICAL INSTRUMENTATION and its applications as follows: 2. • Learning the skill of using medical devices 3. • Developing a technician capable of understanding the physical mechanisms of how medical devices work 4. • Understanding the skill and diagnosis of the appropriate device for each medical condition

9. Teaching and Learning Strategies

	Preparing students with a high level of understanding, awareness, and

Strategy	comprehension of how medical devices work, along with an understanding of their physical mechanism and how to use the appropriate device for each medical condition.

10. Course Structure

Week	Hours	Required learning outcomes	Unit or subject name (Theoretical)	Learning method (Practical)	Evaluation method
1	2	Mentioned within previous point according to the contents	INTRODUCTION A medical device	What it is and how it works	Daily quizzes, live questioning and discussion
2	2	=	Microscopes	What it is and how it works	Daily quizzes, live questioning and discussion
3	2	=	Centrifuge	What it is and how it works	Daily quizzes, live questioning and discussion
4	2	=	First Exam.	Present	Daily quizzes, live questioning and discussion
5	2	=	.Incubator	What it is and how it works	Daily quizzes, live questioning and discussion
6	2	=	chemical fume hood	What it is and how it works	Exam.
7	2	=	X.ray	What it is and how it works	Daily quizzes, live questioning and discussion
8	2	=	Ultrasound	What it is and how it works	Daily quizzes, live questioning and discussion
9	2	=	Second exam.	Present	Daily quizzes, live questioning and discussion
10	2	=	CT.scan	What it is and how it works	Daily quizzes, live questioning and discussion
11	2	=	MRI	What it is and how it works	Daily quizzes, live questioning and discussion
12	2	=	Laser	What it is and how it works	Daily quizzes, live questioning and discussion
13	2	=	Final practical exams + final theory exams	Present	Daily quizzes, live questioning and discussion
14	2	=	Final practical exams + final theory exams	=	Daily quizzes, live questioning and discussion

15	2	=	Final practical exams + final theory exams	=	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.

Course	Theoretical			Practical			Final – Exam
	First Exam.	First Exam.	Quizzes	First Exam.	First Exam.	Quizzes	
1nd	12	12	4	4	4	4	60

12.Learning and Teaching Resources

Required Textbooks (Curricular Books, if any)	Non
Main References (Sources)	4. Medical Instrumentation Application and Design, 4th Edition (John G. Webster)
Recommended Books and References (Scientific Journals, Reports...)	1-Principles of Biomedical Instrumentation (Andrew G. Webb) 2- Medical Instruments and Devices (Steven Schreiner)
Electronic References, Websites	https://www.medicainstrument.com

Course Description Form

1. Course Name:
Physics of Radiotherapy lab.
2. Course Code:
PHY-414
3. Semester / Year:
First semester / 2025-2026
4. Description Preparation Date:
25-09-2025
5. Available Attendance Forms:
Attendance / Biannual
6. Number of Credit Hours (Total) / Number of Units (Total)
2 / 1unit
7. Course administrator's name (mention all, if more than one name)
Name: lec. Dr. shaimaa hussien shahad , Email: shaima@uowasit.edu.iq
8. Course Objectives

Course Objectives	1. To enable the student to understand the fundamentals of radiotherapy physics and the components of treatment equipment used through practical experiments. 2. To cover the physical principles of radiotherapy physics, the main components of imaging equipment used in radiotherapy, and imaging factors and their impact on improving image quality, with a focus on safety considerations. 3. The course explains the basic details of X-ray generators and X-ray tubes, provides an overview of radiography equipment, and covers key

	concepts in radiotherapy such as doses, their distribution, types, and influencing factors, in addition to radiation protection. 4. Students will learn to compare experimental results with theoretical findings. They will also learn about some properties of nuclear radiation, methods of shielding it, and ways to reduce doses. Finally, they will analyze data and discuss results.

9. Teaching and Learning Strategies

Strategy	• The ability to logically analyze experimental results • The ability to identify the factors affecting the achievement of the Alara principle • Ability to draw and discuss results

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	**2**		Radiation Therapy Devices	Practical application	Written tests
2	**2**	=	Interaction of radiation with human tissues	Practical application	Written tests
3	**2**	=	Alpha Particle Penetration in Human Lung Tissue	Practical application	Written tests
4	**2**	=	Measurement of Half Value Layer (HVL) for X-ray beam	Practical application	Written tests
5	**2**	=	Study of Dose–Depth Curve for a Therapeutic Electron Beam	Practical application	Written tests
6	**2**	=	**Mid-term exam**	Practical application	Written tests
7	**2**	=	Measurement of Scattered Radiation Around a Linear Accelerator	Practical application	Written tests
8	**2**	=	Measurement of Surface Dose in Radiotherapy	Practical application	Written tests
9	**2**	=	Study of Dose–Depth Curve for a Therapeutic neutron Beam	Practical application	Written tests
10	**2**	=	Measurement of Half Value Layer (HVL) for neutron beam	Practical application	Written tests
11	**2**	=	**Mid-term exam**	Practical application	Written tests
12	**2**	=	**Review and audit**		

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

Monthly exams	daily and oral exams	project or report	Experimental exams	Final exam
4	4	6	6	60
				(40 theoretical +20 experimental)

12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	
Main references (sources)	**Nuclear Radiation Physics,by R. Lapp and H. Andrews, Prentic-Hall(1972)**
Recommended books and references (scientific journals, reports…)	**The physics of Radiation Therapy ,3rd aditior Faiz M. Khan,2003** https://ucrfisicamedica.wordpress.com/wp-content/uploads/2010/10/phys-of-radiation-therapy-3-edicion-khan.pdf
Electronic References, Websites	

Course Description Form

1. Course Name:	
Physics of Nuclear Medicine-lab. - Practical	
2. Course Code:	
3. Semester / Year:	
First semester / 2025-2026	
4. Description Preparation Date:	
25/9/2025	
5. Available Attendance Forms:	
Attendance / Biannual	
6. Number of Credit Hours (Total) / Number of Units (Total)	
2 / 1 unit	
7. Course administrator's name (mention all, if more than one name)	
Name: Asst. Prof. Dr. Maitham Salman Amana , Email: malsalem@uowasit.edu.iq	
8. Course Objectives	
Course Objectives	• Enabling the student to deal with radioactive sources • The student's knowledge of comparing the results obtained practically with theoretical results • Identify some of the characteristics of nuclear radiation, ways to block it, and ways to reduce doses • Analyze data and discuss results

9. Teaching and Learning Strategies

Strategy	• The ability to logically analyze experimental results • The ability to identify the factors affecting the achievement of the Alara principle • Ability to draw and discuss results

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Referred to in the previous axis, each according to the content	Concepts of occupational safety and laboratory work	Practical application	Written tests
2	2	=	Operating Potential of Geiger-Muller Tube	Practical application	Written tests
3	2	=	Range of α- particles in the air	Practical application	Written tests
4	2	=	Mean range of β- particles in air	Practical application	Written tests
5	2	=	• The quantum flux of γ-radiation in air	Practical application	Written tests
6	2	=	Mid-term exam	Practical application	Written tests
7	2	=	Attenuation Properties of γ-Rays as a Function of Material Density	Practical application	Written tests
8	2	=	Attenuation Coefficient of Gamma-Rays in Copper	Practical application	Written tests
9	2	=	Geiger Counter Efficiency for Gamma Ray	Practical application	Written tests
10	2	=	Dose meter and Proving Inverse Square Law	Practical application	Written tests
11	2	=	Mid-term exam	Practical application	Written tests
12	2	=	Review and audit		

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

Monthly exams	daily and oral exams	project or report	Experimental exams	Final exam
20	5	3	12	60 (40 theoretical +20 experimental)

12. Learning and Teaching Resources

Required textbooks (curricular books, if any	
Main references (sources)	Introduction to Nuclear and Particle Physics (Second Edition; A. Das & T. Ferbel)
Recommended books and references (scientific journals, reports…)	PHYWE SYSTEME GMBH · Robert-Bosch-Breite 10 · D-37079 · Göttingen ·
Electronic References, Websites	

Course Description Form

1. Course Name:	
Medical image processing	
2. Course Code:	
PHY-422	
3. Semester / Year: 2025-2026	
1st semester/ fourth year	
4. Description Preparation Date:	
1/2/2026	
5. Available Attendance Forms:	
Actual Attendance	
6. Number of Credit Hours (Total) / Number of Units (Total):	
2 per week/1 unit	
7. Course administrator's name (mention all, if more than one name)	
Name: Assit.prof.Dr Mutasim Ibrahim Malik Email: mutasim@uowasit.edu.iq	
8. Course Objectives	
Course Objectives	**The practical objectives of teaching mathematics to students encompass developing mental skills and enhancing the applied understanding of medical image processing concepts in daily life. These objectives can be summarized as follows:** **1. Developing logical and analytical thinking: image processing helps students cultivate critical thinking and structured problem-solving skills.** **2. Enhancing problem-solving skills: Students learn how to analyze problems, formulate hypotheses, and choose appropriate strategies to reach solutions.** **3. Applying image processing concepts to everyday life: Such as**

	managing budgets, measuring distances, calculating bank interest, and analyzing data. **4. Supporting other disciplines: medical image processing is fundamental in sciences, engineering, economics, and various technical fields.** **5. Developing abstract thinking skills: Enabling students to work with numbers, symbols, and complex mathematical relationships.** **6. Promoting accuracy and discipline: Mathematics requires precision in calculations and attention to detail.** **7. Encouraging innovation and creativity: By developing new strategies for solving problems and creating novel image processing methods.** **8. Improving mathematical programming communication skills: Helping students express ideas using mathematical terms, graphs, and tables.** **9. Enhancing the ability to predict and make decisions: Using statistics, probabilities, and mathematical modeling for forecasting and informed decision-making.** **10. Preparing students for the job market: Many careers require strong numerical and analytical skills, especially in STEM fields (Science, Technology, Engineering, and Mathematics).**

9. Teaching and Learning Strategies

Strategy	• **Using presentation, participation, problem solving, and discussion.** • **Using modern technology for education and encouraging students to participate in group discussions.** • **Encouraging students to self-learn and form groups to discuss scientific material.**

10. Course Structure

Week	Hours	Unit or subject name	Required Learning Outcomes	Learning method	Evaluation method

1	2	Introduction to Medical Image Processing • Concept of medical images • Role of image processing in medical physics • Types of medical images: X-ray, CT, MRI, Ultrasound, Nuclear Medicine	**Conducting a practical experiment of Understand the fundamental principles of physics applied in medicine, including radiation physics, nuclear physics, and medical imaging physics Using MATLAB and CVIP software.** **Conducting a practical experiment of Explain the physical basis of major diagnostic imaging modalities, such as X−ray, CT, MRI, Ultrasound, and Nuclear Medicine Using MATLAB and CVIP software.** **Conducting a practical experiment of Analyze radiation interactions with matter and describe their biological effects on human tissues Using MATLAB and CVIP software.** **Conducting a practical experiment of Apply dosimetry concepts to measure, calculate, and evaluate radiation dose in diagnostic and therapeutic procedures Using**	Lecture+ Discussion	Exams
2	2	Fundamentals of Digital Images • Digital image representation • Pixels and gray-level resolution • Spatial and intensity resolution • Noise in medical images		=	=
3	2	Medical Image Acquisition • Principles of image formation • Characteristics of medical imaging systems • Sources of distortion and noise		Lecture	=
4	2	Image Enhancement • Contrast enhancement techniques • Histogram analysis and equalization • Enhancement of low-quality medical images		Lecture+ Discussion	=
5	2	Image Filtering and Noise Reduction • Spatial domain filtering • Mean and median filters • Frequency domain filtering		=	=
6	2	Frequency Domain Analysis • Two-dimensional Fourier Transform		Lecture	=

		• Spatial vs frequency domain interpretation • Medical applications of frequency analysis	**MATLAB and CVIP software.** **Conducting a practical experiment of Understand the principles of radiation protection and safety standards in clinical environments Using MATLAB and CVIP software.** **Interpret medical images using physical image quality parameters, including resolution, contrast, SNR, and CNR.** **Conducting a practical experiment of Apply basic image processing techniques in medical imaging using computational tools (e.g., MATLAB).** **Conducting a practical experiment of Evaluate the performance of medical imaging systems using physical and quantitative metrics Using MATLAB and CVIP software.** **Conducting a practical experiment of Understand the role of DICOM and PACS systems in medical image storage and**		
7	2	Edge Detection and Feature Identification • Edge detection operators: Sobel, Prewitt, Canny • Clinical importance of edge detection		=	=
8	2	Medical Image Segmentation • Thresholding techniques • Region-based and edge-based segmentation • Applications in organ and tumor delineation		=	=
9	2	Image Registration • Rigid and non-rigid registration • Clinical applications of image registration		Lecture+ Discussion	=
10	2	10. Feature Extraction • Geometric and statistical features • Role of features in medical image analysis		=	=
11	2	Image Quality Assessment • Image quality metrics (SNR, CNR) • Physical measures of image quality		=	=
12	2	Medical Image Storage and Communication • DICOM standard • PACS systems		=	=
13	2	Practical Applications • MATLAB-based medical image processing • Mini project		=	=
14	2	Review		=	=
15	2	Exam		=	=

			communication. **Develop problem-solving skills for clinical and research applications in medical physics Using MATLAB and CVIP software.**		

11. Course Evaluation

Exams which include quizzes, midterms, and finals

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Gonzalez, R. C., & Woods, R. E. Digital Image Processing (3rd ed.). Pearson. Available free via academic repositories: https://homepages.inf.ed.ac.uk/rbf/HIPR
Main references (sources)	Prince, J. L., & Links, J. M. Medical Imaging Signals and Systems. Pearson. Free lecture notes and chapters available at: https://engineering.jhu.edu/cism/
	Nishikawa, R. M. Medical Imaging Physics. Free educational resources and lecture notes available at: https://www.aapm.org/education