



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



Description of Academic Program
Madenat Alelem University
College of Science
Department of Medical Physics



2026

Academic Program Description Form

University Name: **Madenat Alelem University**

College/Institute: College of Science

Scientific Department: Department of Medical Physics

Program Name: Bachelor of Science in Medical Physics

Degree Title: Bachelor of Science in Medical Physics

Academic System: Semester-based

Description Preparation Date: 26/2/2026

Date of File Completion: 27/2/2026

Signature:

Head of Department Name: **Waleed N. Raja**

Date: 26/2/2026

Signature:

Scientific Associate Name: **Ass. Proof. Dr Mahmood M. Abdul-Huss**

Date: 27/2/2026

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The file is checked by:

Department of Quality Assurance and University Performance

Director of the Quality Assurance and University Performance Department:

Date:

Signature:



Ass. Prof. Dr. Waleed Nassar Raja

Approval of the Dean

1. Vision

"The Department of Medical Physics aspires to be a leading academic center in education and scientific research, distinguished in preparing qualified professionals capable of applying the principles of physics to medical applications, thus contributing to the development of healthcare and community service according to international standards."

2. Program Mission

"The Medical Physics program aims to prepare graduates who are scientifically and practically qualified in the applications of physics in the medical field, through providing distinguished academic education, developing scientific research skills, and promoting professional values, keeping pace with modern developments and meeting the needs of the health sector and society."

3. Program Objectives

"To prepare qualified professionals in medical physics who possess the knowledge, applied skills, and research capabilities to work efficiently in the health sector and keep abreast of modern developments."

4. Program Accreditation

Ministry of Higher Education and Scientific Research / College Accreditation Councils

5. External Influences

Job Market - Field Visits to Government Departments - Application

6. Program Structure

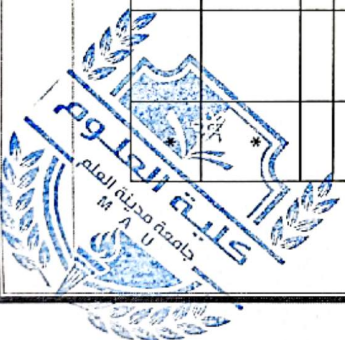
Program Structure	Number of courses,	credit hours,	number of units,	, percentage,	notes*
Institutional Requirements					
College Requirements					
Department Requirements	8	36	30	120%	
Summer Internship	Classes Two and Three				
Other	Training in government hospitals and centers in Baghdad				



1. Faculty

Faculty Members

Name of Faculty Member	Academic Rank	Specialization		Special Requirements /Skills (if any)	Faculty preparation	
		General	Specialized		staff	Lecturer
Waleed Nassar Raja	Assistant Professor	Physics	Nuclear Physics	Clinical Chemistry	*	
Mustafa Kamel Jassim	Assistant Professor	Physics	Physics	Clinical Chemistry	*	
Wissam Abdullah Latif	Lecturer	Physics	Materials Physics	Clinical Chemistry	*	
Ali Kadhim Sayed	Assistant Lecturer	Physics	Medical Physics	Clinical Chemistry	*	
Ola Janan Qasim	Assistant Lecturer	Atmospheric Science	Atmospheric Science	Clinical Chemistry	*	
Karrar Kadhim Karim	Assistant Lecturer	Atmospheric Science	Atmospheric Science	Clinical Chemistry	*	
Chufan Walid Mohammed	Assistant Lecturer	Physics Education	Nuclear Physics	Clinical Chemistry	*	
Khamis Dhari Khamis	Teaching Assistant	Physics	Medical Physics	Clinical Chemistry	*	
Zahraa Hashim Abdul Amir	Teaching Assistant	Physics	Nuclear Physics	Clinical Chemistry	*	
Hassan Abdul Salman	Assistant Professor	Mathematics	Applied Mathematics (cs)			
Nada Mohammed Hassan	Assistant Lecturer	Physics	Materials Physics			



Rabah Salem Sharif	Assistant Professor	Agriculture	Bioprocess Engineering				*
Bilal Jasser Mohammed	Professor	Chemistry	Clinical Chemistry				*

Study plan for the Department of Applied Medical Physics

Year/Level	Course Code	Course Name	Credit Hours				units
			theoretical	Teaching method	practical	Teaching method	
Forth level First semester	MPH24101	Medical Physics II	2	Lectures	2	practical	3
	MPH24102	Medical Image Processing	2	Lectures	2	practical	3
	MPH24103	Radiation Protection	2	Lectures	0		2
	MPH24104	Medical Physics III	2	Lectures	2	practical	3
	MPH24105	Biomaterials	2	Lectures	0		2
Forth level second semester	MPH24106	Graduation Project	2	Lectures	0		2
	MPH24207	Image Analysis	2	Lectures	2	practical	3
	MPH24208	Professional Ethics	2	Lectures	0		2
	MPH24209	Nuclear Medicine	2	Lectures	0		2
	MPH24204	Medical Physics IV	2	Lectures	2	practical	2
	MPH24210	Neurophysics	2	Lectures	0		2
	MPH24211	Medical Accelerators	2	Lectures	0		2
	MPH24206	Graduation Project	2	Lectures	0	practical	2



1. Expected Learning Outcomes of the Program	
Objectives (Knowledge):	
Learning Outcomes	Methods for Assessing Knowledge and Understanding
A1: To produce graduates qualified in medical physics, both theoretically and practically.	-To provide students with a scientific foundation in medical physics. Assessment methods: Written tests, conceptual questions, quizzes.
A2: To develop skills in using modern medical technologies and equipment.	-To develop an understanding of the applications of physics in diagnosis and treatment. Assessment methods: Reports, essay questions, class discussions.
A3: To enhance scientific research and analytical capabilities in the medical field.	-To enhance the ability to interpret medical phenomena and data. Assessment methods: Case studies, analytical tests, homework assignments.
A4: To meet the needs of the healthcare sector with competent and professional personnel.	-To foster an understanding of safety principles and procedures in medical settings. Assessment methods: Written tests, oral assessments, short presentations.
Skills	
Learning Outcomes:	Methods for assessing thinking skills:
B1: Proficiency in using medical devices and technologies.	- Problem-solving through applied problems and case studies.
B2: Accurate analysis of medical data.	- Analysis and study of real-world cases in medical physics.
B3: Application of physics principles in diagnosis and treatment.	- Preparing scientific reports that include interpretation and analysis of results.
B4: Commitment to professional ethics and teamwork.	- Classroom discussions and posing analytical questions. - Presentations that require critical thinking and deduction. - Short research projects.
Values	
Learning Outcomes:	A statement of learning results
C1: Professional Integrity	-Commitment to professional ethics and integrity in work.
C2: Responsibility and Teamwork	-Taking responsibility and working effectively within a team.
C3: Quality	-Adherence to quality and safety standards in the medical environment.
C4: Community Service	-Contributing to community service and promoting health awareness.
2. Teaching and Learning Strategies	
• Lecture • Dialogue and Discussion • Cooperative Learning (Group Classes)	

• Brainstorming

- Reciprocal Teaching
- Posting lectures on the college or department website for all instructors and all course materials
- Using projectors and audio equipment
- Writing research papers and reports in English
- Speaking English in class and during class participation
- Conducting research and experiments to achieve the Sustainable Development Goals

3. Assessment Methods

- Direct question-and-answer sessions during lectures
- Expected and surprise daily quizzes
- Evaluation of research papers and assessment of their writing in terms of style, expression, and spelling
- Questions to measure listening and attention in English
- Student participation in evaluating peer performance
- Practical assessment exams focusing on listening, speaking, and reading
- Monthly and term exams
- Final written exams

Professional Development

Guidance for New Faculty Members

- Diversifying classroom management and lecture delivery methods
- New faculty members are eligible for visits from the department head and senior faculty members during lectures
- Conducting personal interviews to assess faculty competence and teaching skills
- Publishing research in international journals with impact factors, writing books, and participating in workshops and conferences

Faculty Professional Development

- The academic program is reviewed periodically to identify and address any shortcomings.
- Annual evaluation of each module by the department chair or course coordinator.
- Periodic faculty reviews of the academic program.
- Establishment of an external advisory board for the department, comprising student representatives and course participants.
- Periodic evaluation of faculty members by the department chair.
- Student evaluation of faculty members via online surveys.
- Faculty members' self-evaluation.
- Student evaluation of a course term via online surveys.
- Coordination with the college and university quality assurance unit to monitor the implementation of the academic program within the department.



8. Admission Criteria

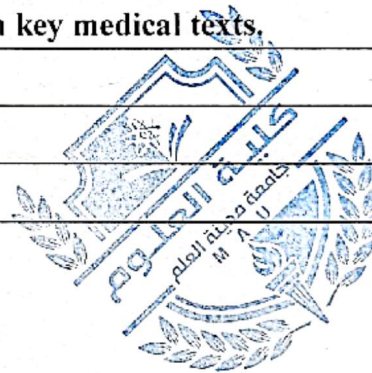
1. The overall average for central admission, which must be within the established limits and in accordance with the directives of the Ministry of Higher Education and Scientific Research.
2. Personal interviews with applicants to document any speech, behavioral, or personality defects.

4. Key Sources of Information about the Program

The College's Quality Assurance Unit, through the University's Quality Assurance Unit, adheres to quality standards and strives to raise the scientific, intellectual, and skill levels, as well as the standards of scientific research, in accordance with the Ministry of Higher Education and Scientific Research's guidelines, which aim to enhance the efficiency of academic programs in line with international quality standards.

5. Program Development Plan

- Encouraging students to utilize medical textbooks.
- Developing conversation, translation, and reading skills through the use of websites and other modern resources.
- Encouraging students to familiarize themselves with key medical texts.



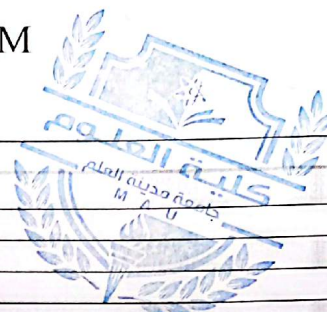
Program Skills Outline

Required program Learning outcomes

Year/Level	Course Code	Course Name	Basic or optional	Knowledge				Skills				Ethics			
				A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4
First level				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
First semester				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
First level				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Second semester				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Second level				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
First semester				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Second level				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Second semester				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Third level				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
First semester				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Third level				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Second semester				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Forth level	MPH24101	Medical Physics II	B	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	MPH24102	Medical Image Processing	C	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	MPH24103	Radiation Protection	B	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	□



MODULE DESCRIPTION FORM



1. Module Title					
Medical Device Physics II					
2. Module Code					
MPH24101					
3. Semester / Year					
Course-based system / First Semester					
4. Date of Course Description Preparation					
9/1/2025					
5. Available Modes of Attendance					
Theoretical and Practical					
6. Total Study Hours / Total Credits					
Theory	32 hours (16 week)		Practical	32 hours (16 week)	2 Theory Units + 1 Practical Unit = 3 Units
7. Course Coordinator(s)					
Ass. Lecture Ali Kadhim sayd					
8. Course Objectives					
Course Objectives	Cognitive objectives: ☐ Establish a thorough understanding of the physical principles governing biomedical instrumentation, diagnostic imaging systems, and therapeutic devices. ☐ To analyze the quantitative interactions between physical energy fields (electrical, magnetic, acoustic, and ionizing radiation) and biological tissues. ☐ To develop analytical skills for assessing bio-signal acquisition, transducer performance, and measurement errors in clinical environments. ☐ To instill strict awareness of electrical safety standards, biohazards, and regulatory protocols in medical technology design and operation.				
	Course-specific skill objectives: 1 - Ability to apply the principles of medical physics. 2 - Ability to analyze medically relevant problems grounded in physics, devise solutions, and propose appropriate alternatives. 3 - Engaging in constructive medical discussions and offering informed opinions. 4 - Enabling graduates to keep pace with research advancements in medical physics that contribute to the development of the medical field				
	☐ Course-specific skill objectives				
9. Teaching and Learning Strategies					
Strategy	- PowerPoint lectures- Educational videos - Directing students to useful websites - Practical laboratory sessions using models				
	Assessment Methods • Quizzes • Monthly exams • Mid-term and final exams				
10. Course structure					
Week	Hours	Required Learning Outcomes	Unit or Topic Name	Learning Method	Assessment Method
1	2	Physics of medical devices	This course presents both the basic physics together with the practical technology associated with such methods as X-ray		



2	2	Physics of medical devices	computed tomography (CT)	Theoretical lectures using PDF and PowerPoint	Daily exams Periodic exams Mid-year exams Final exams
3	2	Physics of medical devices	magnetic resonance imaging (MRI)		
4	2	Physics of medical devices	functional MRI (fMRI)		
5	2	Physics of medical devices	spectroscopy, ultrasonic (echocardiography		
6	2	Physics of medical devices	Doppler flow)		
7	2	Physics of medical devices	PET, and SPECT scans)		
8	2	Physics of medical devices	optical methods such as bioluminescence		
9	2	Physics of medical devices	optical tomography, fluorescent confocal microscopy		
10	2	Physics of medical devices	two-photon microscopy, atomic force microscopy		
11	2	Physics of medical devices	Functional Organization of the Peripheral Nervous System		
12	2	Physics of medical devices	Electro-neuro-gram (ENG).)		
13	2	Physics of medical devices	Electromyogram (EMG		
14	2	Physics of medical devices	Electrocardiogram (ECG), Electro-retina-gram, (ERG), Electroencephalogram (EEG),		
15	2	Physics of medical devices	Magneto-encephalogram (MEG) and Nuclear Radiation Monitoring Instruments		
16	3		Final Exam.		



11. Course Assessment

Attendance and absence grade = 10%.
Daily quiz grade = 10%.
Student in-class assessment grade = 10%.
Mid-term exam grade = 10%.
Final exam grade = 60%.
Final grade = 100%.

12. Learning and Teaching Resources

Required Textbooks (Curriculum materials, if applicable)	ISBN: 978-93-6135-383-3 E-book ISBN: 978-93-6135-805-0 Book DOI: https://doi.org/10.22271/ed.book.2839
Key References (Sources)	
Recommended Books and Supplemental References (Scientific Journals, Reports, etc.)	Scientific journals and websites
Electronic References and Websites	Websites related to research topics
Course Development Plan.	1. Developing the academic content by deleting, adding, and replacing. 2. Using modern teaching methods that are compatible with the level of learners from time to time. 3. Updating the means of evaluating and measuring students' level. 4. Encouraging e-learning. 5. Providing the student with the skills required by the health and medical technical profession and the changes of the times.

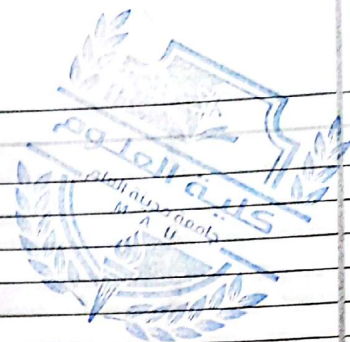
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م.م. علي كاظم



MODULE DESCRIPTION FORM



1. Module Title			
Medical Image Processing			
2. Module Code			
MPH24102			
3. Semester / Year			
Course-based system / First Semester			
4. Date of Course Description Preparation			
9/1/2025			
5. Available Modes of Attendance			
Theoretical and Practical			
6. Total Study Hours / Total Credits			
Theory	32 hours (16 week)	Practical	32 hours (16 week) 2 Theory Units + 1 Practical Unit = 3 Units
7. Course Coordinator(s)			
Ass. Prof Hassan Abed Salman			
8. Course Objectives			
Course Objectives	Cognitive objectives: To foster an academic environment conducive to study and research aimed at finding solutions to medical problems through appropriate technologies—facilitated by courses that establish a strong foundation in health physics and its medical applications—while also actively strengthening the university's ties with the community by providing consultancy services, conducting training, and developing teaching and administrative staff. Course-specific skill objectives: 1- The ability to apply the principles of medical physics. 2 - Analyzing medical problems from the scientific side with a physical basis, arriving at a solution and being able to suggest appropriate alternatives 3 - Constructive medical discussions and expressing opinions. 4 - Enabling graduates to keep pace with research development in the field of medical physics, which contributes to the development of the physician side - the skills objectives of the course.		
9. Teaching and Learning Strategies			
Strategy	- Using PowerPoint presentations. - Educational films. - Directing students to useful websites. - Practical laboratory sessions using models. Assessment Methods - Quizzes - Monthly exams - Mid-term and final exams		



10. Course structure

Week	Hours	Required Learning Outcomes	Unit or Topic Name	Learning Method	Assessment Method
1	2	Image processing	Rapid Prototyping of Image Analysis Applications	Theoretical lectures using PDF and PowerPoint	Daily exams Periodic exams Mid-year exams Final exams
2	2	Image processing	Seeded Segmentation Methods for Medical Image Analysis		
3	2	Image processing	Deformable Models and Level Sets in Image Segmentation.		
4	2	Image processing	Fat Segmentation in Magnetic Images		
5	2	Image processing	Fat Segmentation in Magnetic Images		
6	2	Image processing	Images: A Case Study Using Corneal Nerve Fibers.		
7	2	Image processing	Medical Imaging in the Diagnosis of Osteoporosis and Estimation of the Individual Bone Fracture Risk.		
8	2	Image processing	Applications of Medical Image Processing in the Diagnosis and Treatment of Spinal Deformity.		
9	2	Image processing	Applications of Medical Image Processing in the Diagnosis and Treatment of Spinal Deformity.		
10	2	Image processing	Tortuosity as an Indicator of the Severity of Diabetic Retinopathy		
11	2	Image processing	Medical Image Volumetric Visualization: Algorithms, Pipelines, and Surgical Applications		
12	2	Image processing	Medical Image Volumetric Visualization: Algorithms, Pipelines, and Surgical Applications		
13	2	Image processing	Sparse Sampling in MRI.		
14	2	Image processing	Edge detection, feature extraction, segmentation.		
15	2	Image processing	Edge detection, feature extraction, segmentation.		
16	3		Final Exam.		

جمهورية العراق
وزارة التعليم العالي والبحث العلمي
جامعة مدينة العلم
كلية العلوم
قسم الفيزياء الطبية

11. Course Assessment

Attendance and absence grade = 10%.
Daily quiz grade = 10%.
Student in-class assessment grade = 10%.
Mid-term exam grade = 10%.
Final exam grade = 60%.
Final grade = 100%.

12. Learning and Teaching Resources

Required Textbooks (Curricular materials, if applicable)	Medical Image Processing Techniques and Applications by Geoff Dougherty, 2011
Key References (Sources)	
Recommended Books and Supplemental References (Scientific Journals, Reports, etc.)	Scientific journals and websites
Electronic References and Websites	Websites related to research topics
Course Development Plan.	1. Developing the academic content by deleting, adding, and replacing. 2. Using modern teaching methods that are compatible with the level of learners from time to time. 3. Updating the means of evaluating and measuring students' level. 4. Encouraging e-learning. 5. Providing the student with the skills required by the health and medical technician profession and the changes of the times.

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MODULE DESCRIPTION FORM

1. Module Title

Radiation Protection

2. Module Code

MPH24103

3. Semester / Year

Course-based system / First Semester

4. Date of Course Description Preparation

9/1/2025

5. Available Modes of Attendance

Theoretical

6. Total Study Hours / Total Credits

Theory	32 hours (16 week)	Practical	2 Theory Units + 0 Practical Unit = 2 Units
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7. Course Coordinator(s)

Lecture Dr. Jamal Kadhim Jaber

8. Course Objectives

Course Objectives

Cognitive objectives:

- Understanding radiation physics: understanding the properties of ionizing radiation (alpha, beta, gamma) and its interaction with living matter.
- Understanding dose concepts: accurately distinguishing between different radiological quantities (radioactivity, absorbed dose, equivalent dose, and effective dose) and their units of measurement.
- Knowledge of biological effects: understanding the mechanisms by which radiation affects human cells and tissues (deterministic versus random effects).
- Familiarity with the principles of prevention (ALARA): Understanding the three principles of radiation protection: Justification, Optimization, and Dose Limitation, with an emphasis on the principle of "the lowest amount that is reasonably achievable."
- Study regulations and legislation: knowledge of international and national standards (such as ICRP and IAEA recommendations) that govern the use of radioactive materials.
- Incident Management: Understanding the correct scientific procedures for dealing with radiation emergencies, such as spills or radioactive contamination.

Course-specific skill objectives:

- ☐ Professional use of measuring devices: the ability to operate and calibrate radiation scanning devices (Geiger-Müller counters, ionization chambers) accurately to detect contamination.
- ☐ Applying personal protection techniques: Excellence in using personal protective equipment (bullet shields, gloves, lead aprons) and personal monitoring devices (Dosimeters), reading them and interpreting their results.
- ☐ Radioactive Materials Management: Skill in the safe handling of radioactive materials during preparation and injection, including the use of ☐ lead syringes ☐ (syringe shields) and transport containers.
- ☐ Decontamination procedures: Implementing cleaning steps and technical dealing with radioactive spills in accordance with standard protocols (Decontamination procedures).
- ☐ Documentation and Monitoring: Ability to maintain accurate records of radiation doses received by staff and to monitor the disposal of radioactive waste according to authorized schedules (decay-in-storage system).
- ☐ Effective Communication: Skill in instructing and educating patients (and their families) on radiation safety precautions following radioactive treatment or diagnostic procedures to minimize exposure to others.

9. Teaching and Learning Strategies

Strategy

- Using PowerPoint presentations.
- Educational films.
- Directing students to useful websites.
- Practical laboratory sessions using models.

Assessment Methods

- Quizzes
- Monthly exams

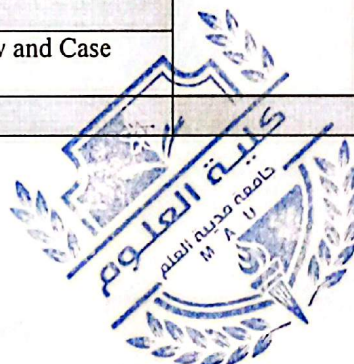




• Mid-term and final exams

10. Course structure

Week	Hours	Required Learning Outcomes	Unit or Topic Name	Learning Method	Assessment Method
1	2	Radiation Protection	• Fundamentals of Radiation Physics	Theoretical lectures using PDF and PowerPoint	Daily exams Periodic exams Mid-year exams Final exams
2	2	Radiation Protection	• Radiation Quantities and Units		
3	2	Radiation Protection	• Biological Effects of Radiation		
4	2	Radiation Protection	• Philosophy of Radiation Protection		
5	2	Radiation Protection	• Detection and Measurement Devices		
6	2	Radiation Protection	• Personal Monitoring Devices		
7	2	Radiation Protection	• Radiation Hazards in Nuclear Medicine		
8	2	Radiation Protection	• Facility Design and Engineering Protection		
9	2	Radiation Protection	• Safe Handling of Radioactive Materials		
10	2	Radiation Protection	• Radioactive Waste Management		
11	2	Radiation Protection	• Accident and Spill Response		
12	2	Radiation Protection	• Patient Radiation Safety		
13	2	Radiation Protection	• International and Local Legislation and Regulations		
14	2	Radiation Protection	• Quality Assurance (QA) Programs		
15	2	Radiation Protection	• Comprehensive Review and Case Studies		
16	3		Final Exam.		





د. جمال کاظمی



MODULE DESCRIPTION FORM

1. Module Title			
Medical Physics III			
2. Module Code			
MPH24104			
3. Semester / Year			
Course-based system / First Semester			
4. Date of Course Description Preparation			
9/1/2025			
5. Available Modes of Attendance			
Theoretical and Practical			
6. Total Study Hours / Total Credits			
Theory	48 hours (16 week)	Practical	32 hours (16 week) 3 Theory Units + 1 Practical Unit = 4 Units
7. Course Coordinator(s)			
Lecture Dr. Wissam Abdalla Lateef and Ass. Lect. Ola Jenan Kassim			
8. Course Objectives			
Course Objectives	Cognitive objectives: The student will be able to identify key applications of electricity and magnetism in medicine (including high-frequency electrical applications and low-frequency electrical and magnetic applications). They will understand the nature of sound, the operation of the stethoscope, and the principles of ultrasound imaging, as well as the human auditory system. Furthermore, the course covers light, ultraviolet waves, and infrared radiation, along with medical laser applications and the physics of the eye and vision.		
	Course-specific skill objectives: Students will learn to operate equipment for examining the human ear and measuring hearing levels, as well as optical instruments and ultrasound (sonar) devices..		
9. Teaching and Learning Strategies			
Strategy	- Using PowerPoint presentations. - Educational films. - Directing students to useful websites. - Practical laboratory sessions using models. Assessment Methods - Quizzes - Monthly exams - Mid-term and final exams		

10. Course structure

Week	Hours	Required learning outcomes	Unit or Topic Name	Learning Method	Assessment Method
1	3	Application of electricity and magnetism in medicine	Electric shock. High frequency electricity		
2	3	Application of electricity and	low frequency electricity and magnetism in medicine		



		magnetism in medicine		Theoretical lectures using PDF and PowerPoint	Daily exams Periodic exams Mid-year exams Final exams
3	3	Application of electricity and magnetism in medicine	Current applied to the body		
4	3	Sound in Medicine	Properties of sound. stethoscope		
5	3	Sound in Medicine	Ultrasound picture. Physiological effects of ultrasound in therapy		
6	3	Sound in Medicine	Production of speech		
7	3	Physics of the ear and hearing	Outer, middle and inner ear		
8	3	Physics of the ear and hearing	Sensitivity of the ear. Testing your hearing		
9	3	Physics of the ear and hearing	Deafness and hearing aids		
10	3	Light in medicine	Application of visible light in Medicine		
11	3	Light in medicine	Application of Ultraviolet and infrared light in medicine		
12	3	Light in medicine	Lasers in Medicine. Microscope in medicine		
13	3	Physics of eyes and vision	Focusing elements of the Eye		
14	3	Physics of eyes and vision	Retina and the light dectecor of the eye		
15	3	Physics of eyes and vision	How little light can you see. Diffraction effects on the eye		
16	3		Final Exam.		



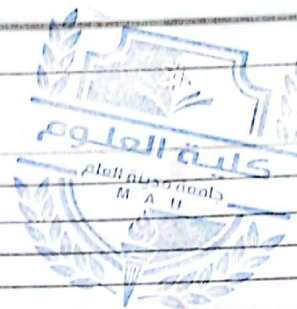
11. Course Assessment	
Attendance and absence grade = 5%.	
Daily quiz grade = 10%.	
Student in-class assessment grade = 10%.	
Mid-term exam grade = 15%.	
Final exam grade = 60%.	
Final grade = 100%.	
12. Learning and Teaching Resources	
Required Textbooks (Curriculum materials, if applicable)	Medical Physics by John R. Cameron.
Key References (Sources)	
Recommended Books and Supplemental References (Scientific Journals, Reports, etc.)	Scientific journals and websites
Electronic References and Websites	Websites related to research topics
Course Development Plan.	1. Developing the academic content by deleting, adding, and replacing. 2. Using modern teaching methods that are compatible with the level of learners from time to time. 3. Updating the means of evaluating and measuring students' level. 4. Encouraging e-learning. 5. Providing the student with the skills required by the health and medical technician profession and the changes of the times.

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د. عبد الله لطيف

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MODULE DESCRIPTION FORM



1. Module Title

Biological materials

2. Module Code

MPH24105

3. Semester / Year

Course-based system / First Semester

4. Date of Course Description Preparation

9/1/2025

5. Available Modes of Attendance

Theoretical

6. Total Study Hours / Total Credits

Theory	32 hours (16 week)	Practical	2 Theory Units + 0 Practical Unit = 2 Units
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7. Course Coordinator(s)

Asst. Prof. Dr. Roaa Muthanna Ali

8. Course Objectives

Course Objectives

Cognitive objectives:

- Understanding structure-function relationships: Grasping how the microscopic and molecular structures of biomaterials determine their mechanical and biological functions.
- Classifying biomaterials: Distinguishing between various types of biomaterials (whether natural, such as proteins and polysaccharides, or synthetic, such as biopolymers and biocompatible metals).
- Comprehending adaptation mechanisms: Understanding how living organisms build and repair their materials (e.g., bone mineralization or tissue healing).
- Understanding biocompatibility: Recognizing the chemical and physical factors that allow a material to coexist with the human body without triggering an immune response or toxicity.
- Recognizing bioengineering applications: Understanding the role of biomaterials in the design of medical devices, implants, and drug delivery systems.

Course-specific skill objectives:

- ☐ Mechanical Analysis Capability: Proficiency in conducting mechanical tests (such as tensile, compression, and hardness tests) on biomaterial samples and analyzing stress-strain curves.
- ☐ Microscopy Techniques: Ability to prepare and examine biological samples using electron (SEM, TEM) or optical microscopes to understand microstructure.
- ☐ Design and Simulation: Proficiency in using computer modeling software to predict biomaterial behavior under various conditions (such as human body loads).
- ☐ Biocompatibility Assessment: Acquiring essential laboratory skills to test material interactions with living cells (cell-material interaction).
- ☐ Scientific Research and Literature Review: Skills in searching modern scientific databases, as well as reading and summarizing research regarding the development of new biomaterials.

9. Teaching and Learning Strategies

Strategy

- Using PowerPoint presentations.
- Educational films.
- Directing students to useful websites.
- Practical laboratory sessions using models.

Assessment Methods

- Quizzes
- Monthly exams
- Mid-term and final exams

10. Course structure

Republic Of Iraq
Ministry of Higher Education & Scientific
Research
Madenat Alelem University
College of Science
Department of Medical Physics



جمهورية العراق
وزارة التعليم العالي والبحث العلمي
جامعة مدينة العلم
كلية العلوم
قسم الفيزياء الطبية

Week	Hours	Required Learning Outcomes	Unit or Topic Name	Learning Method	Assessment Method
1	2	Biological Materials	Introduction to Biomaterials	Theoretical lectures using PDF and PowerPoint	Daily exams Periodic exams Mid-year exams Final exams
2	2	Biological Materials	Biomaterial Structure		
3	2	Biological Materials	Chemical Bonding and Molecular Forces		
4	2	Biological Materials	Proteins		
5	2	Biological Materials	Saccharides		
6	2	Biological Materials	Bio-mineralization		
7	2	Biological Materials	Mechanical Properties		
8	2	Biological Materials	Viscoelastic Behavior		
9	2	Biological Materials	Biocompatibility		
10	2	Biological Materials	Bio-metallurgical Materials		
11	2	Biological Materials	Biopolymers and Biodegradable Materials		
12	2	Biological Materials	Bio-ceramics and Bio-glass		
13	2	Biological Materials	Tissue Engineering		
14	2	Biological Materials	Characterization and Testing Techniques		
15	2	Biological Materials	The Future of Biomaterials		
16	3		Final Exam.		

12. Learning and Teaching Resources

Biomaterials Science: An Introduction to Materials in Medicine (4th Edition)
by Buddy D. Ratner, Allan S. Hoffman, Frederick J. Schoen, and Jack E.
Lemons. Academic Press.

Recommended Books and Supplemental References (Scientific Journals, Reports, etc.)
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Biomaterials: Principles and Applications by Joon Park and R.S. Lakes. CRC Press.

Society for Biomaterials (SFB) — Offers professional resources, educational webinars, and student chapters.

1. Developing the academic content by deleting, adding, and replacing.
2. Using modern teaching methods that are compatible with the level of learners from time to time.
3. Updating the means of evaluating and measuring students' level.
4. Encouraging e-learning.
5. Providing the student with the skills required by the health and medical technician profession and the changes of the times.



MODULE DESCRIPTION FORM

1. Module Title

Research Project I

2. Module Code

MPH24106

3. Semester / Year

Course-based system / First Semester

4. Date of Course Description Preparation

9/1/2025

5. Available Modes of Attendance

Theoretical

6. Total Study Hours / Total Credits

Theory	32 hours (16 week)	Practical	2 Theory Units + 0 Practical Unit = 2 Units
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7. Course Coordinator(s)

Department Faculty Members

8. Course Objectives

Course Objectives

Cognitive objectives:

- 1- Literature Synthesis: Critically evaluate peer-reviewed research, clinical guidelines, and technological advancements in medical physics sub-disciplines such as diagnostic radiology, radiation therapy, and nuclear medicine.
- 2- Hypothesis Formulation: Design independent research questions and experimental frameworks grounded in fundamental physical principles and clinical relevance.
- 3- Data Analysis and Interpretation: Apply advanced statistical methods, computational models, and error propagation analysis to interpret complex experimental or simulated datasets.
- 4- Critical Evaluation: Assess research findings and experimental outcomes against established theoretical models, international safety limits, and regulatory standards.

Course-specific skill objectives:

- 1- Technical and Instrumental Proficiency: Operate specialized measurement tools, dosimetry equipment, phantom systems, or computational simulation software (e.g., MATLAB, Python, Monte Carlo toolkits) relevant to medical physics.
- 2- Methodological Execution: Implement rigorous data acquisition protocols, calibration procedures, and safety measures in experimental, clinical, or simulation environments.
- 3- Scientific Communication: Author structured research reports, technical documentation, and manuscripts adhering to standardized academic formatting, data visualization best practices, and citation styles.
- 4- Professional Presentation: Deliver clear oral defenses and visual presentations of research findings to academic panels, articulating complex biophysical and clinical concepts concisely.

9. Teaching and Learning Strategies

Strategy

- Using PowerPoint presentations.
- Educational films.
- Directing students to useful websites.
- Practical laboratory sessions using models.

Assessment Methods

- Quizzes
- Monthly exams
- Mid-term and final exams

10. Course structure



Week	Hours	Required Learning Outcomes	Unit or Topic Name	Learning Method	Assessment Method
1	2	Research Project	Proposal Defense	Theoretical lectures using PDF and PowerPoint	Daily exams Periodic exams Mid-year exams Final exams
2	2	Research Project	Literature Review Completion		
3	2	Research Project	Safety Protocol Approval		
4	2	Research Project	Equipment and Software Calibration		
5	2	Research Project	Pilot Study Execution		
6	2	Research Project	Data Collection Initiation		
7	2	Research Project	Mid-Term Progress Review		
8	2	Research Project	Data Processing and Cleaning		
9	2	Research Project	Model Implementation and Simulation		
10	2	Research Project	Statistical Evaluation		
11	2	Research Project	Results Interpretation		
12	2	Research Project	Drafting the Final Report		
13	2	Research Project	Visual Data Formatting		
14	2	Research Project	Manuscript Revision		
15	2	Research Project	Final Project Defense		
16	3		Final Exam.		





11. Course Assessment

Attendance and absence grade = 5%.
Daily quiz grade = 10%.
Student in-class assessment grade = 10%.
Mid-term exam grade = 15%.
Final exam grade = 60%.
Final grade = 100%.

12. Learning and Teaching Resources

Required Textbooks (Curriculum materials, if applicable)	Books, sources, scientific journals, and recent research publications relevant to the student's research specialization.
Key References (Sources)	
Recommended Books and Supplemental References (Scientific Journals, Reports, etc.)	Scientific journals and websites
Electronic References and Websites	Websites related to research topics
Course Development Plan.	1. Developing the academic content by deleting, adding, and replacing. 2. Using modern teaching methods that are compatible with the level of learners from time to time. 3. Updating the means of evaluating and measuring students' level. 4. Encouraging e-learning. 5. Providing the student with the skills required by the health and medical technician profession and the changes of the times.

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رئيس القسم

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MODULE DESCRIPTION FORM

1. Module Title			
Medical accelerators			
2. Module Code			
MPH24211			
3. Semester / Year			
Course-based system / First Semester			
4. Date of Course Description Preparation			
9/1/2025			
5. Available Modes of Attendance			
Theoretical			
6. Total Study Hours / Total Credits			
Theory	32 hours (16 week)	Practical	2 Theory Units + 0 Practical Unit = 2 Units
7. Course Coordinator(s)			
Asst. Lect. Ihsan Hadi Obaidi			
8. Course Objectives			
Course Objectives	Cognitive objectives: Focuses on understanding the physical and engineering principles that make an accelerator a precise medical tool: • Understanding the physics of charged particles: understanding the dynamics of the movement of electrons and protons under the influence of electric and magnetic fields (Lorentz force). • Mastering the principles of accelerators: understanding the physical workings of linear accelerators (LINACs) and proton accelerators (Cyclotrons/Synchrotrons), and how particles gain kinetic energy. • Study the interaction of radiation with matter: understanding the basic physical processes when accelerated particles collide with matter (such as the Compton effect, pair production, and the "Bragg" effect of protons). • Familiarity with control and processing systems: Understand how to convert electronic signals into beam shaping using multi-leaf collimators (MLC). • Radiation safety and protection standards: Understanding the physical design of accelerator rooms (radiation shields, interference systems, and radiation leakage control) to ensure the protection of patients and medical staff. Course-specific skill objectives: Focuses on the applied ability to operate, maintain and adjust accelerators in the clinical environment: ☐ Dosimetry: Acquire the skill of using ionization chambers and water dosimetry devices to ensure that the dose resulting from the accelerator matches the planned dose. ☐ Quality Assurance - QA: Implementing accelerator accuracy testing protocols, including checking beam symmetry, flatness, and isocenter accuracy. ☐ Digital radiation planning: Being able to use planning software (TPS) to model the radiation beams generated by the accelerator and their distribution within the patient's tissues with extreme accuracy. ☐ Troubleshooting: The skill of analyzing common technical faults in the Vacuum System or Electron Gun based on physical indicators. ☐ Programming and operating protocols: Ability to design the ☐ Beam Delivery Path ☐ and determine the physical parameters required for each clinical case.		
9. Teaching and Learning Strategies			
Strategy	• Using PowerPoint presentations. • Educational films. • Directing students to useful websites. • Practical laboratory sessions using models. Assessment Methods • Quizzes • Monthly exams • Mid-term and final exams		



10. Course structure

Week	Hours	Required Learning Outcomes	Unit or Topic Name	Learning Method	Assessment Method
1	2	Medical accelerators	History and Evolution.	Theoretical lectures using PDF and PowerPoint	Daily exams Periodic exams Mid-year exams Final exams
2	2	Medical accelerators	Basic Principles of Charged Particle Acceleration.		
3	2	Medical accelerators	Vacuum Systems.		
4	2	Medical accelerators	Electron Gun and Injection Systems.		
5	2	Medical accelerators	Radiofrequency (RF) Power Systems.		
6	2	Medical accelerators	The Accelerating Waveguide.		
7	2	Medical accelerators	Beam Steering and Transport.		
8	2	Medical accelerators	Beam Shaping and Delivery.		
9	2	Medical accelerators	Multi-Leaf Collimators (MLC).		
10	2	Medical accelerators	Target Physics and X-ray Production.		
11	2	Medical accelerators	Proton and Heavy Ion Accelerators.		
12	2	Medical accelerators	Dosimetry Protocols (TG-51.		
13	2	Medical accelerators	Quality Assurance (QA) and Performance.		
14	2	Medical accelerators	Safety and Radiation Shielding.		
15	2	Medical accelerators	Emerging Accelerator Technologies.		
16	3		Final Exam.		



11. Course Assessment	
Attendance and absence grade = 5%. Daily quiz grade = 10%. Student in-class assessment grade = 10%. Mid-term exam grade = 15%. Final exam grade = 60%. Final grade = 100%.	
12. Learning and Teaching Resources	
Required Textbooks (Curriculum materials, if applicable)	Medical Applications of Accelerators By Alexander W. Chao Weiren Chou 2009
Key References (Sources)	
Recommended Books and Supplemental References (Scientific Journals, Reports, etc.)	Scientific journals and websites
Electronic References and Websites	Websites related to research topics
Course Development Plan.	1. Developing the academic content by deleting, adding, and replacing. 2. Using modern teaching methods that are compatible with the level of learners from time to time. 3. Updating the means of evaluating and measuring students' level. 4. Encouraging e-learning. 5. Providing the student with the skills required by the health and medical technical profession and the changes of the times.

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الشيخ



MODULE DESCRIPTION FORM

1. Module Title

Medical Physics IV

2. Module Code

MPH24204

3. Semester / Year

Course-based system / First Semester

4. Date of Course Description Preparation

9/1/2025

5. Available Modes of Attendance

Theoretical and Practical

6. Total Study Hours / Total Credits

Theory	48 hours (16 week)	Practical	32 hours (16 week)	3 Theory Units + 1 Practical Unit = 4 Units
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7. Course Coordinator(s)

Lecture Dr. Wissam Abdalla Lateef and Ass. Lect. Ola Jenan Kassim

8. Course Objectives

Course Objectives	Cognitive objectives: Students will learn how X-rays are generated, how radiographic images are formed, and the radiation dosage to which a patient is exposed. They will also study the physics of nuclear medicine, including nuclear sources, nuclear medicine imaging equipment, diagnostic and therapeutic applications of radioactivity, and radiation dosimetry. Additionally, the course covers radiation protection and the use of computers in medicine.. Course-specific skill objectives: Students will learn to operate X-ray equipment and radiation dosimetry devices, as well as utilize radiation protection systems and medical software applications.
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9. Teaching and Learning Strategies

Strategy	- Using PowerPoint presentations. - Educational films. - Directing students to useful websites. - Practical laboratory sessions using models. Assessment Methods - Quizzes - Monthly exams - Mid-term and final exams
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10. Course structure

Week	Hours	Required learning outcomes	Unit or Topic Name	Learning Method	Assessment Method
1	3	Physics of Diagnostic X-Ray	Production of X-Ray		
2	3	Physics of Diagnostic X-Ray	Radiation to patients from X-Ray		
3	3	Physics of Diagnostic X-Ray	X-Ray Slices the body		



4	3	Physics of Isotopes in Medicine	Sources of radioactivity for nuclear medicine	Theoretical lectures using PDF and PowerPoint	Daily exams Periodic exams Mid-year exams Final exams
5	3	Physics of Isotopes in Medicine	Basic instrumentation and its clinical application. Nuclear imaging devices.		
6	3	Physics of Isotopes in Medicine	Therapy with radioactivity. Radiation doses		
7	3	Physics of radiation Therapy	The dose units used in radiotherapy(Rad, Gray)		
8	3	Physics of radiation Therapy	Principles of radiation therapy, course in radiotherapy treatment planning		
9	3	Physics of radiation Therapy	Megavoltage therapy. Closing thought on radiotherapy		
10	3	Radiation protection	Biological effects of ionizing radiation		
11	3	Radiation protection	Radiation protection units and limits. Radiation protection instrumentation		
12	3	Radiation protection	Radiation protection in radiation therapy. Radiation accident		
13	3	Computers in medicine	Laboratory automation		
14	3	Computers in medicine	Patient monitoring		
15	3	Computers in medicine	Hospital bookkeeping		
16	3		Final Exam.		

Attendance and absence grade = 5%.
Daily quiz grade = 10%.
Student in-class assessment grade = 10%.
Mid-term exam grade = 15%.
Final exam grade = 60%.
Final grade = 100%.

Required Textbooks (Curriculum materials, if applicable)	Medical Physics by John R. Cameron.
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Recommended Books and Supplemental References (Scientific Journals, Reports, etc.)
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Scientific journals and websites

Websites related to research topics

1. Developing the academic content by deleting, adding, and replacing.
2. Using modern teaching methods that are compatible with the level of learners from time to time.
3. Updating the means of evaluating and measuring students' level.
4. Encouraging e-learning.
5. Providing the student with the skills required by the health and medical technician profession and the changes of the times.



MODULE DESCRIPTION FORM

1. Module Title

Research Project II

2. Module Code

MPH24206

3. Semester / Year

Course-based system / First Semester

4. Date of Course Description Preparation

9/1/2025

5. Available Modes of Attendance

Theoretical

6. Total Study Hours / Total Credits

Theory	32 hours (16 week)	Practical	2 Theory Units + 0 Practical Unit = 2 Units
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7. Course Coordinator(s)

Department Faculty Members

8. Course Objectives

- Course Objectives**
- Cognitive objectives:**
- 1- Literature Synthesis: Critically evaluate peer-reviewed research, clinical guidelines, and technological advancements in medical physics sub-disciplines such as diagnostic radiology, radiation therapy, and nuclear medicine.
 - 2- Hypothesis Formulation: Design independent research questions and experimental frameworks grounded in fundamental physical principles and clinical relevance.
 - 3- Data Analysis and Interpretation: Apply advanced statistical methods, computational models, and error propagation analysis to interpret complex experimental or simulated datasets.
 - 4- Critical Evaluation: Assess research findings and experimental outcomes against established theoretical models, international safety limits, and regulatory standards.
- Course-specific skill objectives:**
- 1- Technical and Instrumental Proficiency: Operate specialized measurement tools, dosimetry equipment, phantom systems, or computational simulation software (e.g., MATLAB, Python, Monte Carlo toolkits) relevant to medical physics.
 - 2- Methodological Execution: Implement rigorous data acquisition protocols, calibration procedures, and safety measures in experimental, clinical, or simulation environments.
 - 3- Scientific Communication: Author structured research reports, technical documentation, and manuscripts adhering to standardized academic formatting, data visualization best practices, and citation styles.
 - 4- Professional Presentation: Deliver clear oral defenses and visual presentations of research findings to academic panels, articulating complex biophysical and clinical concepts concisely.

9. Teaching and Learning Strategies

- Strategy**
- Using PowerPoint presentations.
 - Educational films.
 - Directing students to useful websites.
 - Practical laboratory sessions using models.

Assessment Methods

- Quizzes
- Monthly exams
- Mid-term and final exams



10. Course structure



Week	Hours	Required Learning Outcomes	Unit or Topic Name	Learning Method	Assessment Method
1	2	Research Project	Proposal Defense	Theoretical lectures using PDF and PowerPoint	Daily exams Periodic exams Mid-year exams Final exams
2	2	Research Project	Literature Review Completion		
3	2	Research Project	Safety Protocol Approval		
4	2	Research Project	Equipment and Software Calibration		
5	2	Research Project	Pilot Study Execution		
6	2	Research Project	Data Collection Initiation		
7	2	Research Project	Mid-Term Progress Review		
8	2	Research Project	Data Processing and Cleaning		
9	2	Research Project	Model Implementation and Simulation		
10	2	Research Project	Statistical Evaluation		
11	2	Research Project	Results Interpretation		
12	2	Research Project	Drafting the Final Report		
13	2	Research Project	Visual Data Formatting		
14	2	Research Project	Manuscript Revision		
15	2	Research Project	Final Project Defense		
16	3		Final Exam.		





11. Course Assessment

Attendance and absence grade = 5%.
Daily quiz grade = 10%.
Student in-class assessment grade = 10%.
Mid-term exam grade = 15%.
Final exam grade = 60%.
Final grade = 100%.

12. Learning and Teaching Resources

Required Textbooks (Curriculum materials, if applicable)	Books, sources, scientific journals, and recent research publications relevant to the student's research specialization.
Key References (Sources)	
Recommended Books and Supplemental References (Scientific Journals, Reports, etc.)	Scientific journals and websites
Electronic References and Websites	Websites related to research topics
Course Development Plan.	1. Developing the academic content by deleting, adding, and replacing. 2. Using modern teaching methods that are compatible with the level of learners from time to time. 3. Updating the means of evaluating and measuring students' level. 4. Encouraging e-learning. 5. Providing the student with the skills required by the health and medical technician profession and the changes of the times.

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MODULE DESCRIPTION FORM

1. Module Title				
Image analysis				
2. Module Code				
MPH24207				
3. Semester / Year				
Course-based system / First Semester				
4. Date of Course Description Preparation				
9/1/2025				
5. Available Modes of Attendance				
Theoretical and Practical				
6. Total Study Hours / Total Credits				
Theory	32 hours (16 week)	Practical	32 hours (16 week)	2 Theory Units + 1 Practical Unit = 3 Units
7. Course Coordinator(s)				
Ass. Prof Hassan Abed Salman				
8. Course Objectives				
Course Objectives	Cognitive objectives: - Mathematical Foundations: Analyze the fundamental mathematical operations underlying digital image processing, including discrete Fourier transforms, convolution, spatial filtering, and sampling theory. - Image Enhancement Principles: Evaluate spatial and frequency domain enhancement techniques—such as histogram equalization, edge detection, and smoothing filters—to improve image contrast and visual quality. - Segmentation and Registration Theory: Differentiate between various image segmentation algorithms (thresholding, region growing, active contours) and spatial registration frameworks used to align multi-modality clinical datasets. - Quantitative Feature Extraction: Interpret methods for extracting quantitative morphological, textural, and intensity-based features from medical images for advanced computational diagnostics. - Quality and Artifact Assessment: Appraise common imaging artifacts, noise sources, and image quality metrics (such as signal-to-noise ratio and contrast-to-noise ratio) across modalities like MRI, CT, and Ultrasound. Course-specific skill objectives: - Algorithm Implementation: Program core image processing and filtering algorithms using scientific computing languages such as Python (utilizing libraries like OpenCV, NumPy, and SciPy) or MATLAB. - Clinical Pipeline Execution: Construct end-to-end image processing pipelines encompassing DICOM data loading, preprocessing, segmentation, and visualization. - Feature Extraction and Analysis: Compute quantitative image biomarkers and statistical metrics from medical datasets to support clinical decision-making or research tasks. - Performance Evaluation: Quantify the accuracy, sensitivity, and specificity of image segmentation and registration algorithms using ground-truth comparisons and validation metrics.			
9. Teaching and Learning Strategies				
Strategy	- Using PowerPoint presentations. - Educational films. - Directing students to useful websites. - Practical laboratory sessions using models.			
	Assessment Methods - Quizzes - Monthly exams - Mid-term and final exams			
10. Course structure				





Week	Hours	Required Learning Outcomes	Unit or Topic Name	Learning Method	Assessment Method
1	2	Image analysis	Continuous and discrete image representation	Theoretical lectures using PDF and PowerPoint	Daily exams Periodic exams Mid-year exams Final exams
2	2	Image analysis	Continuous and discrete image representation		
3	2	Image analysis	Sampling and reconstruction.		
4	2	Image analysis	Sampling and reconstruction.		
5	2	Image analysis	Quantization.		
6	2	Image analysis	Quantization.		
7	2	Image analysis	Spatial domain		
8	2	Image analysis	Spatial domain		
9	2	Image analysis	intensity transformations.		
10	2	Image analysis	intensity transformations.		
11	2	Image analysis	Convolution.		
12	2	Image analysis	Image enhancement/restoration.		
13	2	Image analysis	Image enhancement/restoration.		
14	2	Image analysis	Edge detection, feature extraction, segmentation.		
15	2	Image analysis	Edge detection, feature extraction, segmentation.		
16	3		Final Exam.		

11. Course Assessment

Attendance and absence grade = 10%.

Daily quiz grade = 10%.

Student in-class assessment grade = 10%.

Mid-term exam grade = 10%.

Final exam grade = 60%.

Final grade = 100%.

12. Learning and Teaching Resources

Required Textbooks (Curriculum material if applicable) Introduction to Image Processing and Analysis, by John C. Russ, J. Christian Russ 2017

Key References (Sources)

Recommended Books and Supplemental References (Scientific Journals, Reports, etc.)

Scientific journals and websites

Electronic References and Websites

Websites related to research topics

Course Development Plan.

1. Developing the academic content by deleting, adding, and replacing.
2. Using modern teaching methods that are compatible with the level of learners from time to time.
3. Updating the means of evaluating and measuring students' level.
4. Encouraging e-learning.
5. Providing the student with the skills required by the health and medical technicians profession and the changes of the times.

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د. ف. ر. هادي

د. ف. ر. هادي





MODULE DESCRIPTION FORM

1. Module Title

Professional Ethics

2. Module Code

MPH24208

3. Semester / Year

Course-based system / First Semester

4. Date of Course Description Preparation

9/1/2025

5. Available Modes of Attendance

Theoretical

6. Total Study Hours / Total Credits

Theory	32 hours (16 week)	Practical	2 Theory Units + 0 Practical Unit = 2 Units
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7. Course Coordinator(s)

Assistant Lecturer Ali Kadhim Sayid

8. Course Objectives

Course Objectives	Cognitive objectives: • Familiarity with general ethical principles: Understanding the four principles of biomedical ethics (autonomy, beneficence, non-maleficence, and justice) and their application within the context of medical physics. • Knowledge of legislation and regulations: Comprehending local and international regulations (such as IAEA standards) governing the use of ionizing radiation in the medical field. • Understanding radiation safety protocols: A theoretical grasp of the ALARA principle (As Low As Reasonably Achievable) to minimize radiation exposure for patients and staff. • Awareness of legal and professional responsibility: Distinguishing between professional malpractice, negligence, and criminal or civil liability in the event of radiation dosage errors. • Understanding data confidentiality: Knowledge of the ethics and laws regarding patient data privacy protection, particularly in the era of digital transformation and medical imaging.
	Course-specific skill objectives: ☐ Understanding data confidentiality: Knowledge of the ethics and laws regarding patient data privacy protection, particularly in the era of digital transformation and medical imaging. ☐ Ethical decision-making skills: The ability to analyze complex ethical dilemmas (such as conflicts between patient interests and workplace pressures or resource constraints) and make balanced decisions. ☐ Professional communication skills: The ability to convey complex technical information to patients or the medical team transparently and clearly, while remaining mindful of the patient's psychological state. ☐ Documentation and accountability: The skill of accurately and transparently maintaining radiation records and adhering to radiation incident reporting protocols without attempting to conceal incidents. ☐ Teamwork within the medical team: The ability to effectively fulfill the medical physicist's leadership or consultative role alongside physicians and technicians, while maintaining professional boundaries. ☐ Handling emergencies: Developing the ability to act ethically and swiftly in the event of a radiation leak or a calibration error that threatens patient safety.

9. Teaching and Learning Strategies

Strategy	• Using PowerPoint presentations. • Educational films. • Directing students to useful websites. • Practical laboratory sessions using models.
	Assessment Methods • Quizzes • Monthly exams • Mid-term and final exams



10. Course structure

Week	Hours	Required Learning Outcomes	Unit or Topic Name	Learning Method	Assessment Method
1	2	Professional Ethics	• Introduction to Professional Ethics	Theoretical lectures using PDF and PowerPoint	Daily exams Periodic exams Mid-year exams Final exams
2	2	Professional Ethics	• Principles of Biomedical Ethics		
3	2	Professional Ethics	• Professional Responsibility of the Medical Physicist		
4	2	Professional Ethics	• International Legislation and Regulations		
5	2	Professional Ethics	• Radiation Safety Principle (ALARA)		
6	2	Professional Ethics	• Informed Consent		
7	2	Professional Ethics	• Data Handling and Privacy		
8	2	Professional Ethics	• Management of Errors and Radiation Incidents		
9	2	Professional Ethics	• Conflict of Interest		
10	2	Professional Ethics	• Ethics in Medical Scientific Research		
11	2	Professional Ethics	• Professional Communication and Teamwork		
12	2	Professional Ethics	• Occupational Safety for Personnel		
13	2	Professional Ethics	• Ethics in the Digital Age and Artificial Intelligence		
14	2	Professional Ethics	• Ethics in Emergency Situations		
15	2	Professional Ethics	• Future of the Profession and Ethical Commitment		
16	3		Final Exam.		

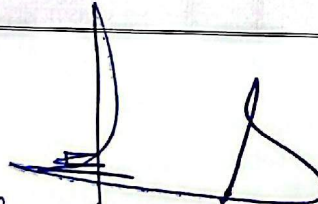


11. Course Assessment

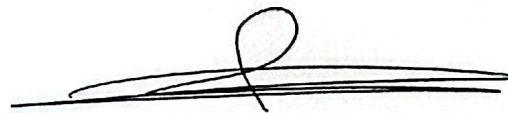
Attendance and absence grade = 5%.
Daily quiz grade = 10%.
Student in-class assessment grade = 10%.
Mid-term exam grade = 15%.
Final exam grade = 60%.
Final grade = 100%.

12. Learning and Teaching Resources

Required Textbooks (Curriculum materials, if applicable)	Ethics and Etiquette of the University Teaching Profession. By Saada Hamdi Sweidan and Abdul-Wahid Hamid Al-Kubaisi (2012).
Key References (Sources)	
Recommended Books and Supplemental References (Scientific Journals, Reports, etc.)	Scientific journals and websites
Electronic References and Websites	Websites related to research topics
Course Development Plan.	1. Developing the academic content by deleting, adding, and replacing. 2. Using modern teaching methods that are compatible with the level of learners from time to time. 3. Updating the means of evaluating and measuring students' level. 4. Encouraging e-learning. 5. Providing the student with the skills required by the health and medical technician profession and the changes of the times.


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د. علي حافض



MODULE DESCRIPTION FORM

1. Module Title

Nuclear Medicine

2. Module Code

MPH24209

3. Semester / Year

Course-based system / First Semester

4. Date of Course Description Preparation

9/1/2025

5. Available Modes of Attendance

Theoretical

6. Total Study Hours / Total Credits

Theory	32 hours (16 week)	Practical	2 Theory Units + 0 Practical Unit = 2 Units
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7. Course Coordinator(s)

Asst. Prof. Dr. Jamal Kadhim Jabir

8. Course Objectives

Course
Objectives

Cognitive objectives:

- Understanding Radiation Physics: Familiarity with the properties of radioactive decay, nuclear reactions, and the interaction mechanisms of radiation (alpha, beta, gamma) with matter.
- Knowledge of Radiation Sources (Radiopharmaceuticals): Studying the production of radioisotopes (via nuclear reactors, cyclotrons, and technetium generators).
- Detector Operation Mechanisms: Comprehending the operating principles of scintillation detectors, gamma cameras, and PET/CT and SPECT imaging systems.
- Radiobiology: Understanding the interaction of radiation with biological tissues, as well as concepts regarding absorbed dose and equivalent dose.
- Safety Management: Familiarity with radiation protection standards, international protection regulations, and radioactive waste handling procedures.

Course-specific skill objectives:

- ☐ Equipment Calibration: Ability to perform periodic quality control tests on gamma cameras and dose calibrators to ensure imaging accuracy.
- ☐ Data and Image Analysis: Using specialized software for nuclear medicine image processing, image reconstruction, and extracting quantitative measurements from functional studies.
- ☐ Dosimetry: Proficiency in calculating the radiation dose absorbed by the patient based on the injected radioactivity and the specific radioisotope used.
- ☐ Practical Radiation Protection: Applying radiation protection principles (time, distance, and shielding) when handling patients or radioactive materials.
- ☐ Technical Problem-Solving: The ability to diagnose common equipment malfunctions and provide technical solutions or coordinate with specialized maintenance services.
- ☐ Handling Emergencies: Developing the ability to act ethically and swiftly in the event of a radiation leak or a calibration error that compromises patient safety.

9. Teaching and Learning Strategies

Strategy

- Using PowerPoint presentations.
- Educational films.
- Directing students to useful websites.
- Practical laboratory sessions using models.

Assessment Methods

- Quizzes
- Monthly exams
- Mid-term and final exams



10. Course structure

Week	Hours	Required Learning Outcomes	Unit or Topic Name	Learning Method	Assessment Method
1	2	Nuclear Medicine	Fundamentals of Nuclear Physics.	Theoretical lectures using PDF and PowerPoint	Daily exams Periodic exams Mid-year exams Final exams
2	2	Nuclear Medicine	Radiation Interactions.		
3	2	Nuclear Medicine	Radionuclide Production.		
4	2	Nuclear Medicine	Radiation Detectors.		
5	2	Nuclear Medicine	Gamma Camera Instrumentation.		
6	2	Nuclear Medicine	SPECT Imaging Physics.		
7	2	Nuclear Medicine	PET Imaging Physics.		
8	2	Nuclear Medicine	Digital Image Processing.		
9	2	Nuclear Medicine	Image Reconstruction Algorithms.		
10	2	Nuclear Medicine	Quality Control (QC).		
11	2	Nuclear Medicine	Dose Calibration & Instrumentation.		
12	2	Nuclear Medicine	Internal Dosimetry.		
13	2	Nuclear Medicine	Radiation Protection & Safety.		
14	2	Nuclear Medicine	Clinical Radiopharmaceuticals & Bio-distribution.		
15	2	Nuclear Medicine	Advanced & Emerging Technologies.		
16	3		Final Exam.		

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جامعة مدينة العلم
كلية العلوم
قسم الفيزياء الطبية

11. Course Assessment

Attendance and absence grade = 5%.
Daily quiz grade = 10%.
Student in-class assessment grade = 10%.
Mid-term exam grade = 15%.
Final exam grade = 60%.
Final grade = 100%.

12. Learning and Teaching Resources

Required Textbooks (Curriculum materials, if applicable)	Nuclear Medicine Physics By Amir Shahzad and Sajid bashir 2019.
Key References (Sources)	
Recommended Books and Supplemental References (Scientific Journals, Reports, etc.)	Scientific journals and websites
Electronic References and Websites	Websites related to research topics
Course Development Plan.	1. Developing the academic content by deleting, adding, and replacing. 2. Using modern teaching methods that are compatible with the level of learners from time to time. 3. Updating the means of evaluating and measuring students' level. 4. Encouraging e-learning. 5. Providing the student with the skills required by the health and medical technician profession and the changes of the times.

قسم
علوم الفيزياء الطبية
رئيس القسم



د. جمال کاظم جابر



MODULE DESCRIPTION FORM

1. Module Title

Neurophysics

2. Module Code

MPH24210

3. Semester / Year

Course-based system / First Semester

4. Date of Course Description Preparation

9/1/2025

5. Available Modes of Attendance

Theoretical

6. Total Study Hours / Total Credits

Theory	32 hours (16 week)	Practical	2 Theory Units + 0 Practical Unit = 2 Units
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7. Course Coordinator(s)

Asst. Lect. Ali Kadhim Sayyid

8. Course Objectives

Course Objectives

Cognitive objectives:

These objectives aim to establish the theoretical foundation enabling students to understand the functioning of the nervous system in physical terms:

- Understanding the physical basis of the nerve impulse: Grasping the Nernst equation and the Goldman-Hodgkin-Katz equation to describe membrane potential and ion movement through neuronal channels.
- Analyzing mathematical models of neurons: Studying the Hodgkin-Huxley model to understand the generation and propagation of action potentials.
- Familiarity with the physics of neural signals: Understanding the nature of electromagnetic signal propagation within axons and the application of electrical circuit theory (resistance, capacitance, and inductance) to model the neuronal membrane.
- Recognizing neuroimaging and measurement techniques: Understanding the physical principles underlying techniques such as Electroencephalography (EEG), Magnetoencephalography (MEG), and functional Magnetic Resonance Imaging (fMRI).
- Comprehending the interaction between external fields and the nervous system: Understanding the effects of external magnetic and electric fields (such as Transcranial Magnetic Stimulation—TMS) on neuronal activity.

Course-specific skill objectives:

These objectives aim to enable students to apply theoretical knowledge in laboratory, research, or clinical contexts:

- ☐ Modeling and simulating neuronal activity: Developing the ability to use software (such as MATLAB or Python) to create digital simulations of action potentials or neural signal propagation within a simple neural network.
- ☐ Neural Signal Processing and Analysis: Proficiency in handling data from bio-measurement devices (EEG/EMG), including noise filtering and frequency analysis (Fourier Transform).
- ☐ Interpretation of Physical Measurements: Skill in correlating digital data (such as voltage-time curves) with the underlying neurophysiological phenomena.
- ☐ Designing Neuro-physical Experiments: Ability to design experiments to measure nerve conduction velocity or the impact of physical variables (e.g., temperature or ion concentration) on the efficiency of nerve impulse transmission.
- ☐ Critical Evaluation of Medical Technologies: Competence in assessing the accuracy and limitations of physical measurement devices used in diagnosing neurological disorders, based on medical physics principles.

9. Teaching and Learning Strategies

Strategy

- Using PowerPoint presentations.
- Educational films.
- Directing students to useful websites.
- Practical laboratory sessions using models.

Assessment Methods

- Quizzes
- Monthly exams



• Mid-term and final exams

10. Course structure

Week	Hours	Required Learning Outcomes	Unit or Topic Name	Learning Method	Assessment Method
1	2	Neuro-physics	Foundations of Neurobiology for Physicists	Theoretical lectures using PDF and PowerPoint	Daily exams Periodic exams Mid-year exams Final exams
2	2	Neuro-physics	Action Potentials and Signal Propagation.		
3	2	Neuro-physics	Synaptic Transmission and Neural Coding.		
4	2	Neuro-physics	Electrophysiology Basics.		
5	2	Neuro-physics	Biophysics of Brain Signals.		
6	2	Neuro-physics	Physics of Magnetic Resonance Imaging (MRI).		
7	2	Neuro-physics	Advanced MRI Techniques.		
8	2	Neuro-physics	Functional MRI (fMRI) Physics.		
9	2	Neuro-physics	Magnetoencephalography (MEG).		
10	2	Neuro-physics	Neuro-Instrumentation		
11	2	Neuro-physics	Statistical Analysis in Neuroscience.		
12	2	Neuro-physics	Computational Neuroscience.		
13	2	Neuro-physics	Neuroimaging Analysis & AI.		
14	2	Neuro-physics	Clinical Neuro-Applications.		
15	2	Neuro-physics	Theranostics & Emerging Tech.		
16	3		Final Exam.		



11. Course Assessment

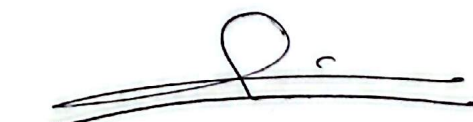
Attendance and absence grade = 5%.
Daily quiz grade = 10%.
Student in-class assessment grade = 10%.
Mid-term exam grade = 15%.
Final exam grade = 60%.
Final grade = 100%.

12. Learning and Teaching Resources

Required Textbooks (Curriculum materials, if applicable)	Neuroscience by Alan Longstaff 2005
Key References (Sources)	
Recommended Books and Supplemental References (Scientific Journals, Reports, etc.)	Scientific journals and websites
Electronic References and Websites	Websites related to research topics
Course Development Plan.	1. Developing the academic content by deleting, adding, and replacing. 2. Using modern teaching methods that are compatible with the level of learners from time to time. 3. Updating the means of evaluating and measuring students' level. 4. Encouraging e-learning. 5. Providing the student with the skills required by the health and medical technician profession and the changes of the times.


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