

Republic of Yemen

Ministry of Higher Education & Scientific Research

Emirates International University



Faculty of Medicine & Health Sciences

Department of Medicine

Program of Bachelor of Medicine

Course Specification of

Medical Physics

Course No. ()

Review committee:

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Head of the Department

A handwritten signature in blue ink, featuring a prominent vertical stroke and a large loop at the bottom.

Quality Assurance head

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Dean of Faculty

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I. Course Identification and General Information:

1	Course Title:	Medical Physics			
2	Course Code & Number:				
3	Credit Hours:	Credit Hours	Theory Hours		Lab. Hours
			Lecture	Exercise	
		3	2	--	2
4	Study Level/ Semester at which this Course is offered:	Level 1 / 1 ST Semester			
5	Pre –Requisite (if any):	Nil			
6	Co –Requisite (if any):			
7	Program (s) in which the Course is Offered:	Bachelor of Pharm D			
8	Language of Teaching the Course:	English			
9	Study System:	Semester			
10	Mode of Delivery:	Full Time			
11	Location of Teaching the Course:	Faculty of Medicine & Health Sciences			
12	Prepared by:	Dr. Issam AL-Kahtani			

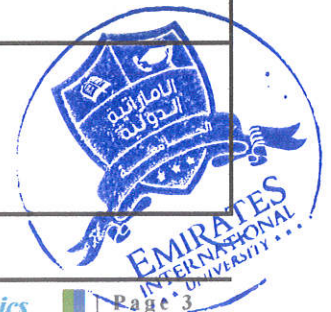
II. Course Description:

The course aims to introduce basic concepts and principles of physics; they clarify the relation between physics and medical & health sciences. Topics covered will include measurements, energy, work and power in our bodies, periodic motion, wave motion, medical applications of electromagnetic spectrum, sound waves, medical applications of ultrasound, fluid mechanics, pressure, blood pressure, viscosity, surface tension, temperature and heat in medicine.

This course focus to applications of physics in medical & health.

The practical part includes measurements, density, viscosity, temperature scales, specific heat of materials, hock's law, lenses and sound speed.

III. Course Intended Learning Outcomes (CILOs) : Upon successful completion of the course, students will be able to:		Referenced PILOs	
A. Knowledge and Understanding:		I, A or E	
a1	Identify the fundamentals of physics and related with medical sciences.		A1 A2 A3 A4
a2	Describe the importance of physics in medicine.		
a3	Explain the diagnostic and therapeutic applications of physics in medicine.		
a4	Specify the kinds of influence of the electromagnetic spectrum ranges on people's health.		
B. Intellectual Skills:			
b1	Apply the acquired physically technical theoretical knowledge in their work during practical classes.		B1 B2
b2	Evaluate physical (both natural and technological) phenomena, their effect on the human body and their application in medical diagnostics.		
C. Professional and Practical Skills:			
c1	Perform the conversion operations of the units he needs in his studies.		C1 C2
c2	Solve the various exercises for this course Correctly.		
D. Transferable Skills:			
d1	Design and complete independent research projects.		D1 D2
d2	Communicate effectively, both orally		



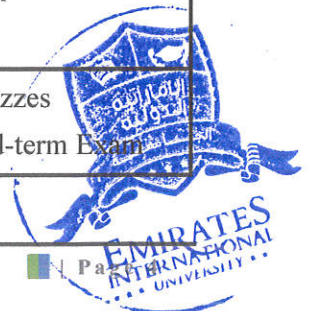
	and in writing, with colleagues, faculty, scientific journals, and research funding agencies.		
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(A) Alignment of Course Intended Learning Outcomes (Knowledge and Understanding) to Teaching Strategies and Assessment Methods:

	Course Intended Learning Outcomes	Teaching Strategies	Assessment Strategies
a1	Identify the fundamentals of physics and related with medical sciences.	- Lectures - Seminars - Discussion	- Quizzes - Mid-term Exam - Final Written Exam
a2	Describe the importance of physics in medicine.	- Lectures - Seminars - Discussion	- Quizzes - Mid-term Exam - Final Written Exam
a3	Explain the diagnostic and therapeutic applications of physics in medicine.	- Lectures - Seminars - Discussion	- Quizzes - Mid-term Exam - Final Written Exam
a4	Name and evaluate kinds of influence of the electromagnetic spectrum ranges on people's health.	- Lectures - Seminars - Discussion	- Quizzes - Mid-term Exam - Final Written Exam

(B) Alignment of Course Intended Learning Outcomes (Intellectual Skills) to Teaching Strategies and Assessment Methods:

	Course Intended Learning Outcomes	Teaching Strategies	Assessment Strategies
b1	Apply the acquired physically technical theoretical knowledge in their work during practical classes.	- Lectures - Seminars - Discussion	- Quizzes - Mid-term Exam - Final Written Exam
b2	Evaluate physical (both natural and technological)	- Lectures - Seminars	- Quizzes - Mid-term Exam



phenomena, their effect on the human body and their application in medical diagnostics	- Discussion	- Final Written Exam
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(C) Alignment of Course Intended Learning Outcomes (Professional and Practical Skills) to Teaching Strategies and Assessment Methods:

Course Intended Learning Outcomes	Teaching Strategies	Assessment Strategies
c1 Perform the conversion operations of the units he needs in his studies.	<ul style="list-style-type: none"> ▪ Lectures. ▪ Lab Experiments ▪ Group learning and Problem-based learning, 	<ul style="list-style-type: none"> ▪ laboratory and other written reports ▪ Quizzes ▪ Final Practical Exam
c2 - Solve the various exercises for this course Correctly.	<ul style="list-style-type: none"> ▪ Lectures. ▪ Lab Experiments ▪ Group learning and Problem-based learning, 	<ul style="list-style-type: none"> ▪ laboratory and other written reports ▪ Quizzes ▪ Final Practical Exam

(D) Alignment of Course Intended Learning Outcomes (Transferable Skills) to Teaching Strategies and Assessment Methods:

Course Intended Learning Outcomes	Teaching Strategies	Assessment Strategies
d1 Design and complete independent research projects.	<ul style="list-style-type: none"> ▪ Discussion ▪ Self Learning ▪ Seminars 	<ul style="list-style-type: none"> ▪ Discussion. ▪ Group work
d2 Communicate effectively, both orally and in writing, with colleagues, faculty, scientific journals, and research funding agencies.	<ul style="list-style-type: none"> ▪ Discussion ▪ Self Learning ▪ Seminars 	<ul style="list-style-type: none"> ▪ Discussion. ▪ Group work

IV. Course Contents:

A. Theoretical Aspect:

No.	Units/Topics List	Sub Topics List	Number of Weeks	Contact Hours	Learning Outcomes (CILOs)
1	Introduction	<ul style="list-style-type: none"> – Physical science – Relation between medical sciences and physical science. 	1	2	a2, a3

No.	Units/Topics List	Sub Topics List	Number of Weeks	Contact Hours	Learning Outcomes (CILOs)
		– Medical physics			
2	Measurements & physical quantities	<ul style="list-style-type: none"> – Measurements – Measurement systems – Physical quantities – Basic quantities – Derived quantities – Conversions – Exercises 	2	4	a1,a2,c1, c2
3	Work, Power & Energy in Our Bodies	<ul style="list-style-type: none"> – Work – Work types – Work of human heart – Power of human heart – Energy – Types of energy – Food energy – Conversions 	2	4	a1,c1,c2
4	Waves & Electromagnetic Spectrum	<ul style="list-style-type: none"> – Periodic motion – Wave motion – Electromagnetic spectrum (x-rays, ultraviolet, etc.) – Medical applications of electromagnetic spectrum (radiotherapy) – Laser rays in medicine – Sound waves – Ultrasound in medicine – Description of waves – Exercises 	3	6	a2,a4,b1, b2,d1
5	Mid-Term Theoretical Exam		1		



No.	Units/Topics List	Sub Topics List	Number of Weeks	Contact Hours	Learning Outcomes (CILOs)
6	Fluids Mechanic & Applications	<ul style="list-style-type: none"> - Fluids - States of matter - Fluid properties - Density, specific gravity - Exercises - Pressure - Pressure in fluids - Blood pressure - Atmospheric pressure - Absolute and gauge pressure - Conversions of pressure - Pascal's law - Principle of Archimedes - Surface tension - Viscosity - Stock's law - Exercises 	3	6	a1,b1, c2, d1
7	Temperature and heat in medicine	<ul style="list-style-type: none"> - Temperature - Temperature Measurement Devices - Temperature scales - Conversions of temperature - Thermograph-mapping the body's temperature - Heat - Specific heat capacity - Heat therapy 	3	6	a1,a2,a3, b1,b2
12	Final Exam		1	2	
Number of Weeks /and Units Per Semester			16	32	

B. Case Studies and Practical Aspect:

No.	Tasks/ Experiments	Week Due	Contact Hours	Learning Outcomes (CILOs)
1	Measurements	1,2,3	6	b1, c1, c2,

No.	Tasks/ Experiments	Week Due	Contact Hours	Learning Outcomes (CILOs)
2	Calculation of materials density	4	2	b1, c1, c2,
3	Hock's law	5	2	a1,b1
4	Measured wavelength, frequency and energy of rays	6	2	b1, c1, c2,
5	Surface tension	7	2	b1, c1, c2,
6	Mid-Term Practical Exam	8	2	
7	Viscosity	9	2	b1
8	Atmospheric pressure	10	2	b1, c1, c2
9	Optics	11,12	4	b1,c1, c2, d1
10	Specific heat	13	2	b1,b2, c1
11	Revision	14	2	
14	Final Practical Exam	15	2	
Number of Weeks /and Units Per Semester		15	30	

C. Tutorial Aspect:

No.	Tutorial	Number of Weeks	Contact Hours	Learning Outcomes (CILOs)
1	- Introduction - Graphs - Experimental errors - Error percentage	1	2	a1,d1
2	Measurement tools	2	4	b1, c1, c2
3	Measured of gravity acceleration	1	2	b1, c1
4	Calculation of materials density	1	2	b1, c1

No.	Tutorial	Number of Weeks	Contact Hours	Learning Outcomes (CILOs)
5	Hock's law	1	2	b1, d1, c2
6	Measured wavelength, frequency and energy of rays	1	2	a4, b1, b2, c1
6	Mid-Term Practical Exam	1	2	
7	Viscosity	1	2	b1, c1, c2
8	Atmospheric pressure	1	2	b1, c1, c2
9	Lenses , mirrors Reflection ,refraction	2	4	b1, c1, c2,d1
10	Specific heat	1	2	b1, c1, c2
11	Revision	1	2	
14	Final Practical Exam	1	2	
Number of Weeks /and Units Per Semester		15	30	

V. Teaching Strategies of the Course:

- Interactive lectures,
- Lectures
- Presentation
- Discussion
- Self-learning
- Lab Experiments
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VI. Assessment Methods of the Course:

Quizzes

- Midterm Exam
- Final Written Exam
- Final Practical Exam
- laboratory and other written report



-Discussion.

VII. Assignments:

No.	Assignments	Week Due	Mark	Aligned CILOs (symbols)
1	Assignment 1: Collect ten types of food and determine the energy of each type.	6	10	a2, c2, d1
2	Assignment 2: Prepare a short report on applications of electromagnetic waves in medicine.	10	10	a2, b1, c2, d1
3	Assignment 3: Write a report on heat therapy.	13	10	d1, d2
Total			30	

VIII. Schedule of Assessment Tasks for Students During the Semester:

No.	Assessment Method	Week Due	Mark	Proportion of Final Assessment	Aligned Course Learning Outcomes
1	Assignments	6, 10, 13	5	5%	a2, b1, c2, d1, d2
2	Quizzes 1 & 2	6, 12	5	5%	a1, a2, b1
3	Mid-Term Theoretical Exam	8	20	20%	a1, a2, b1
4	Mid-Term Practical Exam	9	10	10%	b1, b2, c1, c2, d1, d2
5	Final Practical Exam	15	10	10%	b2, c1, d1, d2
6	Final Theoretical Exam	16	50	50%	a1, a2, b1, b2
Total			100	100%	

IX. Learning Resources:

- Written in the following order: Author, Year of publication, Title, Edition, Place of publication, Publisher.

1- Required Textbook(s) (maximum two):

- 1- Brown, Brian H., et al. Medical physics and biomedical engineering. Taylor & Francis 2017.

2- Maqbool, Muhammad, ed. An introduction to medical physics. Springer, 2017.

2- Essential References:

- 1- Serway, Raymond A., and John W. Jewett. *Physics for scientists and engineers with modern physics*. Cengage learning, 2018.
- 2- Decher, Reiner. *Energy conversion: Systems, flow physics and engineering*. No. BOOK. New York: Oxford university press, 1994.
- 3- Podgoršak, Ervin B. "Radiation physics for medical physicists." (2006).
- 4- Halliday, David, Robert Resnick, and Jearl Walker. *Fundamentals of physics*. John Wiley & Sons, 2013.
- 5- Manickavasagan, Annamalai, and Hemantha Jayasuriya, eds. *Imaging with electromagnetic spectrum: applications in food and agriculture*. Springer, 2014.
- 6- Truesdell, Clifford, and Kumbakonam Ramamani Rajagopal. *An introduction to the mechanics of fluids*. Springer Science & Business Media, 2010.
- 7- Huilgol, Raja R., and N. Phan-Thien. *Fluid mechanics of viscoplasticity*. Berlin: Springer, 2015.

3- Electronic Materials and Web Sites etc.:

- 1- <http://hyperphysics.phy-astr.gsu.edu>
- 2- <https://ocw.mit.edu>
- 3- <https://www.iop.org>
- 4- <https://www.physicsforums.com/>
- 5- <http://www.schoolarabia.net>
- 6- <https://link.springer.com>
- 7- <https://www.efomp.org>

X. Course Policies: (Based on the Uniform Students' By law (2007))

Class Attendance:

1 Class Attendance is mandatory. A student is considered absent and shall be banned from taking the final exam if his/her absence exceeds 25% of total classes.

2 Tardiness:

	A student will be considered late if he/she is not in class after 10 minutes of the start time of class.
3	Exam Attendance/Punctuality: No student shall be allowed to the exam hall after 30 minutes of the start time, and shall not leave the hall before half of the exam time has passed.
4	Assignments & Projects: Assignments and projects must be submitted on time. Students who delay their assignments or projects shall lose the mark allocated for the same.
5	Cheating: Cheating is an act of fraud that results in the cancelation of the student's exam or assignment. If it takes place in a final exam, the penalties stipulated for in the Uniform Students' Bylaw (2007) shall apply.
6	Forgery and Impersonation: Forgery/Impersonation is an act of fraud that results in the cancelation of the student's exam, assignment or project. If it takes place in a final exam, the penalties stipulated for in the Uniform Students' Bylaw (2007) shall apply.
7	Other policies: The University official regulations in force will be strictly observed and students shall comply with all rules and regulations of the examination set by the Department, Faculty and University Administration.

Faculty of Medicine & Health Sciences

Department of Medicine

Program of Bachelor of Medicine

Course Plan (Syllabus) of Medical Physics

Course No. PHYSC 113

I. Information about Faculty Member Responsible for the Course:						
Name of Faculty Member:	Dr. Issam AL-Kahtani	Office Hours				
Location & Telephone No.:	Sana'a & 771960069					
E-mail:	Ahmedissam09@gmail.com	SAT	SUN	MON	TUE	WED THU

II. Course Identification and General Information:

1	Course Title:	Medical Physics			
2	Course Code & Number:				
3	Credit Hours:	Credit Hours	Theory Hours		Lab. Hours
			Lecture	Exercise	
		3	2	--	2
4	Study Level/ Semester at which this Course is offered:	Level 1 / 1ST Semester			
5	Pre –Requisite (if any):	Nil			
6	Co –Requisite (if any):			
7	Program (s) in which the Course is Offered:	Bachelor of Pharm D			
8	Language of Teaching the Course:	English			
9	Study System:	Semester			
10	Mode of Delivery:	Full Time			
11	Location of Teaching the Course:	Faculty of Medicine & Health Sciences			
12	Prepared by:	Dr. Issam AL-Kahtani			

III. Course Description:

The course aims to introduce basic concepts and principles of physics; they clarify the relation between physics and medical & health sciences. Topics covered will include measurements, energy, work and power in our bodies, periodic motion, wave motion, medical applications of electromagnetic spectrum, sound waves, medical applications of ultrasound, fluid mechanics.

pressure, blood pressure, viscosity, surface tension, temperature and heat in medicine.

This course focus to applications of physics in medical & health.

The practical part includes measurements, density, viscosity, temperature scales, specific heat of materials, hock's law, lenses and sound speed.

IV. Course Intended Learning Outcomes (CILOs) :

Upon successful completion of the Course, student will be able to:

	A. Knowledge and Understanding:
a1	Identify the fundamentals of physics and related with medical sciences.
a2	Describe the importance of physics in medicine.
a3	Explain the diagnostic and therapeutic applications of physics in medicine.
a4	Specify the kinds of influence of the electromagnetic spectrum ranges on people's health.
	B. Intellectual Skills:
b1	Apply the acquired physically technical theoretical knowledge in their work during practical classes.
b2	Evaluate physical (both natural and technological) phenomena, their effect on the human body and their application in medical diagnostics.
	C. Professional and Practical Skills:
c1	Perform the conversion operations of the units he needs in his studies.
c2	Solve the various exercises for this course Correctly.
	D. Transferable Skills:
d1	Design and complete independent research projects.
d2	Communicate effectively, both orally and in writing, with colleagues, faculty, scientific journals, and research funding agencies.

V. Course Contents:

A. Theoretical Aspect:

No.	Units/Topics List	Sub Topics List	Number of Weeks

No.	Units/Topics List	Sub Topics List	Number of Weeks	Contact Hours
1	Introduction	<ul style="list-style-type: none"> - Physical science - Relation between medical sciences and physical science. - Medical physics 	1	2
2	Measurements & physical quantities	<ul style="list-style-type: none"> - Measurements - Measurement systems - Physical quantities - Basic quantities - Derived quantities - Conversions - Exercises 	2	4
3	Work, Power & Energy in Our Bodies	<ul style="list-style-type: none"> - Work - Work types - Work of human heart - Power of human heart - Energy - Types of energy - Food energy - Conversions 	2	4
4	Waves & Electromagnetic Spectrum	<ul style="list-style-type: none"> - Periodic motion - Wave motion - Electromagnetic spectrum (x-rays, ultraviolet, etc.) - Medical applications of electromagnetic spectrum (radiotherapy) - Laser rays in medicine - Sound waves - Ultrasound in medicine - Description of waves - Exercises 	3	6
5	Mid-Term		1	

No.	Units/Topics List	Sub Topics List	Number of Weeks	Contact Hours
	Theoretical Exam			
6	Fluids Mechanic & Applications	<ul style="list-style-type: none"> - Fluids - States of matter - Fluid properties - Density, specific gravity - Exercises - Pressure - Pressure in fluids - Blood pressure - Atmospheric pressure - Absolute and gauge pressure - Conversions of pressure - Pascal's law - Principle of Archimedes - Surface tension - Viscosity - Stock's law - Exercises 	3	6
7	Temperature and heat in medicine	<ul style="list-style-type: none"> - Temperature - Temperature Measurement Devices - Temperature scales - Conversions of temperature - Thermograph-mapping the body's temperature - Heat - Specific heat capacity - Heat therapy 	3	6
12	Final Exam		1	2
Number of Weeks /and Units Per Semester			16	32

No.	Units/Topics List	Sub Topics List	Number of Weeks	Contact Hours
1	Introduction	<ul style="list-style-type: none"> - Physical science - Relation between medical sciences and physical science. 	1	



No.	Units/Topics List	Sub Topics List	Number of Weeks	Contact Hours
		– Medical physics		
2	Measurements & physical quantities	<ul style="list-style-type: none"> – Measurements – Measurement systems – Physical quantities – Basic quantities – Derived quantities – Conversions – Exercises 	2	4
3	Work, Power & Energy in Our Bodies	<ul style="list-style-type: none"> – Work – Work types – Work of human heart – Power of human heart – Energy – Types of energy – Food energy – Conversions 	2	4
4	Waves & Electromagnetic Spectrum	<ul style="list-style-type: none"> – Periodic motion – Wave motion – Electromagnetic spectrum (x-rays, ultraviolet, etc.) – Medical applications of electromagnetic spectrum (radiotherapy) – Laser rays in medicine – Sound waves – Ultrasound in medicine – Description of waves – Exercises 	3	6
5	Mid-Term Theoretical Exam		1	2
6	Fluids Mechanic & Applications	<ul style="list-style-type: none"> – Fluids – States of matter 	3	

No.	Units/Topics List	Sub Topics List	Number of Weeks	Contact Hours
		<ul style="list-style-type: none"> - Fluid properties - Density, specific gravity - Exercises - Pressure - Pressure in fluids - Blood pressure - Atmospheric pressure - Absolute and gauge pressure - Conversions of pressure - Pascal's law - Principle of Archimedes - Surface tension - Viscosity - Stock's law - Exercises 		
7	Temperature and heat in medicine	<ul style="list-style-type: none"> - Temperature - Temperature Measurement Devices - Temperature scales - Conversions of temperature - Thermograph-mapping the body's temperature - Heat - Specific heat capacity - Heat therapy 	3	6
12	Final Exam		1	2
Number of Weeks /and Units Per Semester			16	32

B. Case Studies and Practical Aspect:

No.	Tasks/ Experiments	Week Due	Contact Hours
1	Measurements	1,2,3	6
2	Calculation of materials density	4	2

No.	Tasks/ Experiments	Week Due	Contact Hours
11	Revision	14	2
14	Final Practical Exam	15	2
Number of Weeks /and Units Per Semester		15	30

C. Tutorial Aspect:

No.	Tutorial	Number of Weeks	Contact Hours
1	- Introduction - Graphs - Experimental errors - Error percentage	1	2
2	Measurement tools	2	4
3	Measured of gravity acceleration	1	2
4	Calculation of materials density	1	2
5	Hock's law	1	2
6	Measured wavelength, frequency and energy of rays	1	2
6	Mid-Term Practical Exam	1	2
7	Viscosity	1	2
8	Atmospheric pressure	1	2
9	Lenses , mirrors Reflection ,refraction	2	4
10		Specific heat	1 2
11	Revision	1	2
14	Final Practical Exam	1	2
Number of Weeks /and Units Per Semester		15	30

VI. Teaching Strategies of the Course:



- Interactive lectures,
- Lectures
- Presentation
- Discussion
- Self-learning
- Lab Experiments
-

VII. Assessment Methods of the Course:

- Quizzes
- -Midterm Exam
- -Final Written Exam
- -Final Practical Exam
- -laboratory and other written report
- -Discussion.

VIII. Assignments:

No.	Assignments	Week Due	Mark
1	Assignment 1: Collect ten types of food and determine the energy of each type.	6	10
2	Assignment 2: Prepare a short report on applications of electromagnetic waves in medicine.	10	10
3	Assignment 3: Write a report on heat therapy.	13	10
Total			30

IX. Schedule of Assessment Tasks for Students During the Semester:

No.	Assessment Method	Week Due	Mark	Proportion of Final Assessment
1	Assignments	6, 10, 13	5	5%
2	Quizzes 1 & 2	6, 12	5	5%
3	Mid-Term Theoretical Exam	8	20	20%

electromagnetic spectrum: applications in food and agriculture. Springer, 2014.

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XI. Course Policies: (Based on the Uniform Students' Bylaw (2007))

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