

Republic of Yemen

Ministry of Higher Education & Scientific Research
21 SEPTEMBER UNIVERSITY for MEDICALS &

APPLIEED SCIENCES




Faculty of Engineering and Computer
Department of Biomedical Engineering

Course Specification of

Biophysics

Course No. (07.12.703)

2022/2023


Prepared by:	Reviewed by:	Head of the Department:	Quality affairs Dean	Dean of College:
Dr. Sadeq Al-Thoaili 	Dr. -----	Dr. Awadh Ali Abdo	Dr. Mohammed Al-Shamahi	Dr. Abdulrahman Obaid

I. Course Identification and General Information:

1	Course Title:	Biophysics			
2	Course Code & Number:	07.12.703			
3	Credit Hours:	Credit Hours	Theory Hours		Lab. Hours
		3	Lecture	Exercise	
			2	2	--
4	Study Level/ Semester at which this Course is offered:	1 st Level / 1 st Semester			
5	Pre –Requisite (if any):	N/A			
6	Co –Requisite (if any):	N/A			
7	Program (s) in which the Course is Offered:	Biomedical Engineering Information Technology			
8	Language of Teaching the Course:	English - Arabic			
9	Study System:	Regular (semester)			
10	Mode of Delivery:	Face-to-face learning			
11	Location of Teaching the Course:	University Campus			
12	Prepared by:	Dr. Sadeq Al-Thoaili			
13	Date of Approval:				


II. Course Description:

Aim of course is to provide the students with the principle knowledge about the Measurement, Estimating, fluids and pressure in fluids, fluids in motion (Hydrodynamics), viscosity, flow in tubes: blood flow, sound and characteristics of

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sound, doppler effect , also this course will provide the students by the valuable information about the specific gravity of the different liquids and solid materials that will enable them to gain the skills in the field of experimental physics and so push them for constructing and developing a simple tools depending on that basic knowledge.

III. Course Intended Learning Outcomes (CILOs) : (مخرجات تعلم المقرر)			Referenced PILOs (مخرجات تعلم البرنامج)	
A. Knowledge and Understanding: Upon successful completion of the course, students will be able to:				
a1	Know the physical measurement and it's units.	I	A1	Explain the appropriate models, theories, mathematical foundations, and techniques related to biomedical engineering technology context.
a2	Understand the fluids, viscosity application for human body, characteristics of sound and doppler effect.	I	A4	Understand an examples of a biomedical engineering technology concept and methods related to maintenance, measurement techniques, programming, creative engineering solutions, analytical skills, applied to healthcare quality and problems of medical devices issues.
B. Intellectual Skills: Upon successful completion of the course, students will be able to:				
b1	Determine the specific gravity of liquid and solids .	I	B1	Use the basic science, mathematical theories, engineering principles to analyze the problems of devices and/or processes relevant to biomedical engineering fields.
b2	Analyze the blood pressure, viscosity, sound Intensity, reflection and doppler effect.	I	B2	Analyze the impacts of problems related to the Biomedical equipments and its solution principles in a creative manner by using a systematic and analytical thinking methods.

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C. Professional and Practical Skills: Upon successful completion of the course, students will be able to:


c1	Evaluate the specific gravity of different liquid and solid.	I	C2	Evaluate an engineering technique, modern analytical tools and required computer programs to analyzing and solve the problems of medical devices.
c2	Construct any experiments for determination of any physical phenomena depending on the view of the physics department .	I	C3	Develop an engineering approach, engineering equipment, instruments to maintenance and conduct experiments, and present results in the biomedical engineering practice.

D. Transferable Skills: Upon successful completion of the course, students will be able to:

d1	Be a successful member of biophysics.	I	D1	Function effectively as an individual, team member, or leader in activities relevant to biomedical engineering, and collaborating to achieve a shared objective.
d2	Illustrate a scientific study in the biophysics laboratories .	I	D3	Exhibit strong IT skills and communicate clearly, both verbally and in written technical reports.

(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	Know the physical measurement and it's units.	<ul style="list-style-type: none"> Interactive lectures, Exercises and home works, 	<ul style="list-style-type: none"> Written exams Coursework activities assessment
a2	Understand the fluids, viscosity application for human body, characteristics of sound and doppler effect.	<ul style="list-style-type: none"> Interactive Class Discussions, Problem based learning, 	<ul style="list-style-type: none"> Home works assignments.

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IV. Course Contents:

A. Theoretical Aspect:

No.	Units/Topics List	Sub Topics List	Number of Weeks	Contact Hours	Learning Outcomes (CLOs)
1	Introduction	<ul style="list-style-type: none"> Introduction to the course. Course objectives Course outlines. 	1 st	2	a1
2	FLUIDS	<ul style="list-style-type: none"> Phases of Matter Density and Specific Gravity 	2 nd	2	a2
3	FLUIDS	<ul style="list-style-type: none"> Pressure in Fluids Atmospheric Pressure and Gauge Pressure Pascal's Principle 	3 ^{ed}	2	a2, b1
4	FLUIDS	<ul style="list-style-type: none"> Measurement of Pressure; Gauges and the Barometer Buoyancy and Archimedes' Principle 	4 th	2	a1, a2, b1
5	FLUIDS	<ul style="list-style-type: none"> Fluids in Motion; Flow Rate and the Equation of Continuity Bernoulli's Equation 	5 th	2	a1, a2, b1
6	FLUIDS	<ul style="list-style-type: none"> Applications of Bernoulli's Principle: Torricelli, Airplanes, Baseballs, Blood Flow 	6 th	2	a1, a2, b1, b2
7	FLUIDS	<ul style="list-style-type: none"> Viscosity Flow in Tubes: Poiseuille's Equation, Blood Flow 	7 th	2	a1, a2, b1, b2
8	FLUIDS	<ul style="list-style-type: none"> Surface Tension and Capillarity Pumps, and the Heart 	8 th	2	a1, a2, b1, b2, c1
9	Mid term Exam	<ul style="list-style-type: none"> All previous topics 	9 th	2	a1, a2, b1, b2, c1
10	Sound	<ul style="list-style-type: none"> Characteristics of Sound Intensity of Sound: Decibels 	10 th	2	a1, a2, b2, c1

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11	Sound	<ul style="list-style-type: none"> The Ear and Its Response; Loudness Sources of Sound: Vibrating Strings and Air Columns 	11 th	2	a2, b2, c1, c2
12	Sound	<ul style="list-style-type: none"> Quality of Sound, and Noise; Superposition Interference of Sound Waves; Beats 	12 th	2	a1, a2, c1, c2
13	Sound	<ul style="list-style-type: none"> Doppler Effect Shock Waves and the Sonic Boom 	13 th	2	a2, b2, c1, c2
14, 15	Sound	<ul style="list-style-type: none"> Applications: Sonar, Ultrasound, and Medical Imaging 	14 th	2	b2, c2
16	Final Theoretical Exam	<ul style="list-style-type: none"> All topics. 	16 th	2	a1, a2, b1, b2, c1, c2,
Number of Weeks /and Units Per Semester			13	26	

B. Practical Aspect:

No.	Tasks/ Experiments	Number of Weeks	Contact Hours	Learning Outcomes (CILOs)
1	None			
2				
3				
4				
Number of Weeks /and Units Per Semester				

C. Tutorial Aspect:

No.	Tutorial	Number of Weeks	Contact Hours	Learning Outcomes (CILOs)

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1	Tutorial in All Topics of Fluids	3 - 7	14	b1, b2, c1, c2, d1, d2
2	Tutorial in All Topics of Sound	9 - 15	14	b1, b2, c1, c2, d1, d2
Number of Weeks /and Units Per Semester		14	28	

V. Teaching Strategies of the Course:

- Interactive lectures,
- Exercises and home works,
- Interactive Class Discussions,
- Problem based learning,
- Directed Self- Study.

VI. Assessment Methods of the Course:

- Written exams
- Coursework activities assessment
- Home works assignments.

VII. Assignments:

No.	Assignments	Week Due	Mark	Aligned CILOs (symbols)
1	Exercises and home works	all	5	a1, a2, b1, b2, c1, c2, d1, d2
Total			5	

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

No.	Assessment Method	Week Due	Mark	Proportion of Final	Aligned Course Learning
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				Assessment	Outcomes
1	Assignments & Quizzes	all	10	10%	a1, a2, a3, b1, b2, c1, c2, c3
2	Midterm Theoretical Exam	8	20	20%	a1, a2, a3, b1, b2, c1, c2
3	Final Theoretical Exam	16	70	70%	a1, a2, b1, b2, c1, c2,
Total			100	100%	

IX. Learning Resources:

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

- 1- Douglas c. Giancoli, 2014, Physics: Principles With Applications, 6th Ed., USA, Pearson Education.
- 2- Douglas c. Giancoli, 2014, Physics: Principles With Applications, 7th Ed., USA, Pearson Education.

2- Essential References:

- 3- Hoppe, W., Lohmann, W., Markl, H., & Ziegler, H. (Eds.). (2012). Biophysics.
- 4- Springer Science & Business Media. Narayanan, P. (2010). Essentials of biophysics. Anshan.
- 5- Das, T. K. (Ed.). (2014). Biophysical methods for biotherapeutics: Discovery and development applications. John Wiley & Sons.

3- Electronic Materials and Web Sites etc.:


Websites:

- 6- Biophysical Society was founded in the 1950s to lead the development and dissemination of knowledge in biophysics through many activities including meetings, publications, community outreach, and career placement.
<https://www.biophysics.org/>

- 1- The IEEE Engineering in Medicine and Biology (EMB) Society Wearable Biomedical Sensors and Systems Technical Committee (TC) is comprised of members interested in promoting the field of wearable and implantable body sensors within the biomedical community. <https://www.embs.org/wbss/>

Journals:

- 2- *The Biophysicist* aims to highlight and nurture education, and its scholarship and

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development. The open access journal serves a worldwide audience to make fundamental concepts and techniques in biophysics (and related disciplines), as well as evidence-based pedagogical practice accessible to individuals at all levels: undergraduate, graduate and post-graduate students/trainees, active researchers, and scholars of biophysics teaching and learning.


<https://www.biophysics.org/the-biophysicist>

- 3- *Biophysics* is a multidisciplinary international peer-reviewed journal that covers a wide scope of problems related to the main physical mechanisms of processes taking place at different organization levels in biosystems.

<https://www.springer.com/journal/11439>

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

1	Class Attendance: 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.

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Second Part of Course Specification

Faculty of **Medial Technology**


Department of **Biomedical Engineering**

Course Plan (Syllabus) of Biophysics

Course No. (07.12.703)

I. Information about Faculty Member Responsible for the Course:						
Name of Faculty Member:						
Location & Telephone No.:						
E-mail:						
	SAT	SUN	MON	TUE	WED	THU
Office Hours						

2022/2023


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I. Course Identification and General Information:

	Course Title:	Biophysics			
2	Course Code & Number:	07.12.703			
3	Credit Hours:	Credit Hours	Theory Hours		Lab. Hours
			Lecture	Exercise	
		3	2	--	2
4	Study Level/ Semester at which this Course is offered:	1 st Level / 1 st Semester			
5	Pre –Requisite (if any):	N/A			
6	Co –Requisite (if any):	N/A			
7	Program (s) in which the Course is Offered:	Biomedical Engineering , Information Technology			
8	Language of Teaching the Course:	English - Arabic			
9	Study System:	Regular (semester)			
10	Mode of Delivery:	Face-to-face learning			
11	Location of Teaching the Course:	University Campus			
12	Prepared by:	Dr. Sadeq Al-Thoaili			
13	Date of Approval:				

II. Course Description:

Aim of course is to provide the students with the principle knowledge about the Measurement, Estimating, fluids and pressure in fluids, fluids in motion (Hydrodynamics), viscosity, flow in tubes: blood flow, sound and characteristics of sound, doppler effect , also this course will provide the students by the valuable information about the specific gravity of the different liquids and solid materials that

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will enable them to gain the skills in the field of experimental physics and so push them for constructing and developing a simple tools depending on that basic knowledge.

III. Course Intended Learning Outcomes (CILOs) : (مخرجات تعلم المقرر)

A. Knowledge and Understanding: Upon successful completion of the course, students will be able to:

- | | |
|----|---|
| a1 | Know the physical measurement and it's units. |
| a2 | Understand the fluids, viscosity application for human body, characteristics of sound and doppler effect. |

B. Intellectual Skills: Upon successful completion of the course, students will be able to:

- | | |
|----|--|
| b1 | Determine the specific gravity of liquid and solids . |
| b2 | Analyze the blood pressure, viscosity, sound Intensity, reflection and doppler effect. |

C. Professional and Practical Skills: Upon successful completion of the course, students will be able to:

- | | |
|----|---|
| c1 | Evaluate the specific gravity of different liquid and solid. |
| c2 | Construct any experiments for determination of any physical phenomena depending on the view of the physics department . |

D. Transferable Skills: Upon successful completion of the course, students will be able to:

- | | |
|----|--|
| d1 | Be a successful member of biophysics. |
| d2 | Illustrate a scientific study in the biophysics laboratories . |


IV. Course Contents:

A. Theoretical Aspect:

No.	Units/Topics List	Sub Topics List	Number of Weeks	Contact Hours
1	Introduction	<ul style="list-style-type: none"> - Introduction to the course. - Course objectives - Course outlines. 	1 st	2
2	FLUIDS	<ul style="list-style-type: none"> - Phases of Matter 	2 nd	2

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		– Density and Specific Gravity		
3	FLUIDS	– Pressure in Fluids – Atmospheric Pressure and Gauge Pressure – Pascal's Principle	3 ^{ed}	2
4	FLUIDS	– Measurement of Pressure; – Gauges and the Barometer – Buoyancy and Archimedes' Principle	4 th	2
5	FLUIDS	– Fluids in Motion; Flow Rate and the Equation of Continuity – Bernoulli's Equation	5 th	2
6	FLUIDS	– Applications of Bernoulli's Principle: Torricelli, Airplanes, Baseballs, Blood Flow	6 th	2
7	FLUIDS	– Viscosity – Flow in Tubes: Poiseuille's Equation, Blood Flow	7 th	2
8	FLUIDS	– Surface Tension and Capillarity – Pumps, and the Heart	8 th	2
9	Mid-term Exam	– Mid-term Exam	9 th	2
10	Sound	– Characteristics of Sound – Intensity of Sound: Decibels	10 th	2
11	Sound	– The Ear and Its Response; Loudness – Sources of Sound: Vibrating Strings and Air Columns	11 th	2
12	Sound	– Quality of Sound, and Noise; Superposition Interference of Sound Waves; Beats	12 th	2
13	Sound	– Doppler Effect Shock Waves and the Sonic Boom	13 th	2
14	Sound	Applications: Sonar, Ultrasound, and Medical Imaging	14 th	2
15	Final Practical	All practical topics.	15 th	2

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	Exam			
16	Final Theoretical Exam	All topics.	16 th	2
Number of Weeks /and Units Per Semester			16	32

B. Case Studies and Practical Aspect:


No.	Tasks/ Experiments	Number of Weeks	Contact Hours
1	None		
2			
3			
4			
Number of Weeks /and Units Per Semester			

C. Tutorial Aspect:

No.	Tutorial	Number of Weeks	Contact Hours
1	Tutorial in All Topics of Fluids	3 – 7	14
2	Tutorial in All Topics of Sound	9 - 15	14
Number of Weeks /and Units Per Semester		14	28

V. Teaching Strategies of the Course:

- Interactive lectures,
- Exercises and home works,
- Interactive Class Discussions,
- Problem based learning,
- Directed Self- Study.

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VI. Assessment Methods of the Course:

- Written exams
- Coursework activities assessment
- Home works assignments.

VII. Assignments:

No.	Assignments	Week Due	Mark
1	Lectures 1,2,3, and 4 Assignment	5	2
2	Lectures 5,6,7, and 9 Assignment	10	2
3	Lectures 10,11,12, and 13 Assignment	14	2
4	Lab reports	15	4
Total			10


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

No.	Assessment Method	Week Due	Mark	Proportion of Final Assessment
1	Assignments & Quizzes	all	10	10%
2	Midterm Theoretical Exam	8	20	20%
3	Final Theoretical Exam	16	70	70%
Total			100	100%

IX. Learning Resources:

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

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- 1- *The Biophysicist* aims to highlight and nurture education, and its scholarship and development. The open access journal serves a worldwide audience to make fundamental concepts and techniques in biophysics (and related disciplines), as well as evidence-based pedagogical practice accessible to individuals at all levels: undergraduate, graduate and post-graduate students/trainees, active researchers, and scholars of biophysics teaching and learning.
<https://www.biophysics.org/the-biophysicist>
- 2- *Biophysics* is a multidisciplinary international peer-reviewed journal that covers a wide scope of problems related to the main physical mechanisms of processes taking place at different organization levels in biosystems.
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X. Course Policies: (Based on the Uniform Students' By law (2007) تترك كما هي)


Class Attendance:

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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.

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