Republic of Yemen

Ministry of Higher Education & Scientific Research

Council of Academic Accreditation & Quality

Assurance of Higher Education (CAQA)

21 September University for medical and Applied Science

Faculty of Engineering and Computer

Department of Biomedical Engineering

Program of Biomedical Engineering

Course Specification of

Biomedical Devices 1

Course Code. (07.02.716)

2024

T4: This Template is Developed and Approved by CAQA-Yemen, 2023

Prepared by:	Reviewed by:	Head of the Department:	Quality Unit:	Dean:
Dr. Mushtaq Alazazi	Dr. Awadh Al-Kubati	Dr. Awadh Al-Kubati	Dr. Mohammed Al-shamahi	Dr. Abdulrahman Obaid

I. General Information:

1.	Course Title:	Biomedical Devices 1				
2.	Course Code:	07.02.716				
3.	Credit Hours:	Credit Hours	Theory Contact Hours		Practical Contact Hours	
			Lecture	Tutorial /Seminar	Lab	Clinical
		3	2	--	2	--
4.	Level/ Semester at which this Course is offered:	3rd Level / 1st Semester				
5.	Pre –Requisite (if any):	07.02.712				
6.	Co –Requisite (if any):	07.02.717				
7.	Program (s) in which the Course is Offered:	Bachelor of Biomedical Engineering				
8.	Language of Teaching the Course:	English/Arabic				
9.	Location of Teaching the Course:	Faculty of Medical Technology				
10.	Prepared by:	Dr. Mushtaq Alazazi				
11	Date and Number of Approval by Council:					

II. Course Description:

This course equips students with the fundamentals of medical devices used throughout a hospital. We'll delve into the core ideas behind these devices, explore how they function, and break down their inner workings using block diagrams from emergency rooms to intensive care units. The course includes: ventilator, anesthesia, patient monitor, defibrillator, electrosurgical devices, dialysis machine, infant incubator, infusion pumps and autoclave. The course focuses on practical activities related to operating, calibrations, troubleshooting, and maintenance of such equipment. By the end of this course, students will possess a solid foundation in the principles, operations, and inner workings of medical devices. This knowledge will empower students to better understand and appreciate the technological advancements that play a vital role in patient care across various hospital settings.

III. Course Intended Learning Outcomes (CILOs) : Upon successful completion of the course, students will be able to:		Referenced PILOs		
	A. Knowledge and Understanding:	I, P or M/A		
a1	Demonstrate a comprehensive understanding of the principles and functions of medical therapeutic and monitoring devices	M	A1	Explain the appropriate models, theories, mathematical foundations, and techniques related to biomedical engineering technology context.
a2	Understand biomedical equipment	M	A4	Understand an examples of a biomedical engineering

	concepts, measurement techniques, maintenance, programming, and problem-solving to improve healthcare quality and device reliability			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:			
b1	analyze problems, design innovative solutions, and optimize medical therapeutic equipment for accurate and efficient therapeutic and monitoring applications	**M**	**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.
b2	Assess the medical treatment and therapy devices according to their specifications and features.	**M**	**B3**	Assess the features of biomedical devices systems, engineering diagnostic skills, technological expertise, and analytical methods that related to identify and addressing of biomedical devices systems failures.
	C. Professional and Practical Skills:			
c1	Utilize a wide range of tools to solve complex problems in medical therapeutic and monitoring devices design for bringing innovative and technologically advanced solutions to life, ultimately improving diagnostic capabilities and patient care.	**M**	**C2**	Relate integrally knowledge of life science, biomedical engineering technology practice concepts, principles of engineering and techniques evaluation to solve problems relevant to biomedical engineering.
c2	Construct, operate and maintain the medical treatment and therapy devices by using rules and regulations of industrial safety.	**M**	**C4**	Develop an engineering approach, engineering equipment, instruments to maintenance and conduct experiments, and present results in the biomedical engineering practice.
	D. Transferable Skills:			
d1	Function effectively in different work environments as an individual, and as a member or leader in multi-disciplinary teams.	**M/A**	**D1**	Function effectively as an individual, team member, or leader in activities relevant to biomedical engineering,

				and collaborating to achieve a shared objective.
I= Introduced, P=Practiced or M/A= Mastered/Advanced				

	(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	Demonstrate a comprehensive understanding of the principles and functions of medical therapeutic and monitoring devices	▪ Interactive lectures & examples, ▪ Interactive class discussions, ▪ computer laboratory-based sessions, ▪ Directed self- study, ▪ Problem based learning, ▪ Team work (cooperative learning)	▪Written tests (mid and final terms and quizzes), ▪Short reports
a2	Understand biomedical equipment concepts, measurement techniques, maintenance, programming, and problem-solving to improve healthcare quality and device reliability		
	(B) Alignment of Course Intended Learning Outcomes (Intellectual Skills) to Teaching Strategies and Assessment Methods:		
	Course Intended Learning Outcomes	**Teaching Strategies**	**Assessment Strategies**
b1	analyze problems, design innovative solutions, and optimize medical therapeutic equipment for accurate and efficient therapeutic and monitoring applications	▪ Interactive lectures & examples, ▪ Presentation/seminar, ▪ Interactive class discussions, ▪ Laboratory/Practical experiments-based session, ▪ computer laboratory-based sessions, ▪ Directed self- study, ▪ Problem based learning, ▪ Team work (cooperative learning)	▪Written tests (mid and final terms and quizzes), ▪Short reports, ▪Lab\Project report ▪ Practical lab performance assessment, ▪Coursework activities assessment
b2	Assess the medical treatment and therapy devices according to their specifications and features.		
	(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	Utilize a wide range of tools to solve complex problems in medical therapeutic and monitoring devices design for bringing innovative and	▪ Presentation/seminar, ▪ Interactive class discussions, ▪ Laboratory/Practical experiments-based	▪ Short reports, ▪ Lab\Project report ▪ Practical lab performance

	technologically advanced solutions to life, ultimately improving diagnostic capabilities and patient care.	session, ▪ computer laboratory-based sessions, ▪ Workshops practices, ▪ Field visits/training ▪ Mini/major project.	assessment, ▪ Presentations
c2	Construct, operate and maintain the medical treatment and therapy devices by using rules and regulations of industrial safety.		

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

	Course Intended Learning Outcomes	Teaching Strategies	Assessment Strategies
d1	Function effectively in different work environments as an individual, and as a member or leader in multi-disciplinary teams.	▪ Presentation/seminar, ▪ Laboratory/Practical experiments-based session, ▪ Workshops practices ▪ Team work (cooperative learning)	▪ Short reports, ▪ Lab\Project report ▪ Presentations

IV. Course Contents:

A. Theoretical Aspect:

No.	Units/Topics List	Sub Topics List	Number of Weeks	Contact Hours	Learning Outcomes (CILOs)
1	**Introduction to Medical therapeutic devices**	– Introduction to the course. – Course outlines. – Overview of biomedical Equipment and Classification – Principles of medical therapeutic devices – Basic design of therapeutic devices – Project description.	1	2	a1, a2, d1
2	**Defibrillator**	– Introduction – Abnormal signals of ECG, – Purpose of Defibrillator – Operation principles of Defibrillator – Design, block diagram, and components of Defibrillator – Maintenance and troubleshooting of	1	2	a1, a2, b2, c2

No.	Units/Topics List	Sub Topics List	Number of Weeks	Contact Hours	Learning Outcomes (CILOs)
		Defibrillator			
3	**Patient Monitor**	– Introduction and medical background on the bio-signal, – – Purpose of Patient Monitor – Operation principles of patient monitor – Design, block diagram, and components of patient monitor – Maintenance and troubleshooting of patient monitor	1	2	a1, a2, b2, c2
4	**Hemodialysis Machine**	- Introduction - Basic principles of Hemodialysis Machine - Purpose of Hemodialysis Machine -Operation principles of Hemodialysis Machine - Design, block diagram, and components of Hemodialysis Machine - Fluid removal: ultrafiltration - Cleaning and disinfection - Monitoring and control -Safety monitors in Hemodialysis – -Maintenance and troubleshooting of Hemodialysis machine	2	4	a1, a2, b2, c2
5	**Electrosurgical unit**	- Introduction and medical - background on the - electrosurgical unit - Operation principles of Electrosurgical unit - Design, block diagram, and components of Electrosurgical unit – Maintenance and troubleshooting of Electrosurgical unit	1	2	a1, a2, b1, c2
6	**Infusion Pump**	– Introduction	1	2	a1, a2,

No.	Units/Topics List	Sub Topics List	Number of Weeks	Contact Hours	Learning Outcomes (CILOs)
		– Purpose of Infusion pump – Operation principles of Infusion pump – Design, block diagram, and components of Infusion pump – Maintenance and troubleshooting of Infusion pump			b1, c2
7	**Mid-Term Theoretical Exam**	– All Previous Topics	1	2	a1, a2, b1, b2
8	**Ventilator Machine**	– Introduction and medical – background on the respiration – in human, – Purpose of Ventilator machine – Operation principles of Ventilator machine – Design, block diagram, and components of Ventilator machine. – Ventilator modes, – Maintenance and troubleshooting of Ventilator machine	2	4	a1, a2, b2, c2
9	**Anesthesia Machine**	– Introduction and medical back – ground for anesthesia, – Purpose of Anesthesia machine – Types of medical gases used in anesthesia, – Operation principles of Anesthesia machine – Design, block diagram, and components of Anesthesia machine – Maintenance and troubleshooting of Anesthesia machine	2	4	a1, a2, b2, c2
10	**Biomedical**	– Introduction	1	2	a1, a2,

No.	Units/Topics List	Sub Topics List	Number of Weeks	Contact Hours	Learning Outcomes (CILOs)
	Laser	– Types of Lasers – Purpose of Laser devices – Operation principles of Laser – Design, block diagram, and components of Laser device – Maintenance and troubleshooting of Laser device			b2, c2
11	Dental chair	– Introduction – Operation principles of Dental chair – Design, block diagram, and -components of Dental chair – Maintenance and troubleshooting of Dental chair	1	2	a1, a2, b2, c2
12	Project Presentation	– Student's Presentation	1	2	d1
13	Final Theoretical Exam	– All Topics	1	2	a1, a2, b1, b2
Number of Weeks /and Units Per Semester			16	32	

B. Practical Aspect (Lab/Clinical) (if any):

No.	Tasks/ Experiments	Number of Weeks	Contact Hours	Learning Outcomes (CILOs)
1	- Identifying the basic components of medical therapeutic devices. - Using practical examples to explain the basic design principles of therapeutic devices.	1	2	a1, a2
2	- Inspecting and understanding the components of a defibrillator. - Operating the defibrillator and observing responses on medical simulators. - Performing routine maintenance techniques.	1	2	a1, b1, c2
3	- Connecting and operating a patient monitor. - Reading and analyzing vital signals (e.g.,	1	2	a1, b2, c1, c2

No.	Tasks/ Experiments	Number of Weeks	Contact Hours	Learning Outcomes (CILOs)
	ECG, SpO2, blood pressure). - Maintenance and troubleshooting of monitoring devices.			
4	- Setting up and operating a hemodialysis machine in a training lab. - Measuring flow rates and cleaning the machine following standard procedures. - Analyzing safety features of the monitoring systems.	1	2	a1, a2, b1, c2
5	- Operating and testing an electrosurgical unit. - Measuring the unit's power and efficiency using electronic measuring devices. - Maintenance and troubleshooting of the system.	1	2	a2, b1, c2
6	- Connecting and operating an infusion pump. - Programming infusion rates and monitoring them practically. - Applying maintenance procedures and diagnosing common errors.	1	2	a2, b1, c2
7	**Mid-Term Practical Exam**	1	2	a1, a2, b1, b2, c1, c2
8	- Setting up and operating a ventilator on a training dummy. - Adjusting various ventilation modes and observing their effects on biomodels. - Maintenance and troubleshooting of ventilators.	1	2	a1, b2, c1, c2
9	- Operating an anesthesia machine and understanding its core components. - Testing the gas system and monitoring pressure and flow. - Maintaining the gas system and ensuring safety.	1	2	a2, b2, c2
10	- Operating a biomedical laser and using it on simulation materials. - Analyzing device performance by studying different laser effects. - Maintenance and inspection of laser systems.	1	2	a2, b1, c2
11	- Operating the dental chair and inspecting its various systems (hydraulic and electrical). - Applying maintenance techniques and	1	2	a1, c1, c2

No.	Tasks/ Experiments	Number of Weeks	Contact Hours	Learning Outcomes (CILOs)
	testing the system's efficiency.			
12	- Preparing practical demonstrations of therapeutic device development projects. - Presenting real-world applications of medical devices used in hospitals.	1	2	b1, c1, d1
13	Final Practical Exam	1	2	a1, a2, b1, b2, c1, c2, d1
Number of Weeks /and Units Per Semester		15	30	

VII. Assignments:

No.	Assignments	Week Due	Mark	Aligned CILOs (symbols)
1	Assignment 1: Several Assignments on all topics learnt in the lectures.	W4-w8	2.5	b1, c1, d1
2	Assignment 2: Several Assignments on all experiments learnt in the practical aspect.	W9-w15	2.5	b2, c2, d1
Total			5	

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	Weekly	5	5%	b1, b2, c1, c2, d1
2	Quizzes 1 & 2	Weeks 4,10	5	5%	a1, a2, b1,b2
3	Mid-Term Theoretical Exam	Week 8	10	10%	a1, a2, b1, b2
4	Mid-Term Practical Exam	Week 8	10	10%	a1, a2, b1, b2, c1, c2
5	Final Practical Exam including Project Presentation & Evaluation	Week 15	20	20%	a1, a2, b1, b2, c1, c2, d1

No.	Assessment Method	Week Due	Mark	Proportion of Final Assessment	Aligned Course Learning Outcomes
6	Final Theoretical Exam	Week 16	50	50%	a1, a2, b1, b2
Total			100%	100%	-

IX. Learning Resources:

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

1. Ed. Joseph D. Bronzino, 2016, The Biomedical Engineering Handbook, Fourth Edition, CRC Press LLC.
2. Roger Narayan, 2019, Wiley Encyclopedia of Biomedical Engineering, Elsevier.

2- Essential References:

1. James Moore, George Zouridakis, 2004, Biomedical Technology and Devices Handbook, CRC Press LLC.
2. 2- Metin Akay, 2006, Wiley Encyclopedia of Biomedical Engineering, John Wiley &Sons, In.
3. James Moore, George Zouridakis, 2004, Biomedical Technology and Devices Handbook, CRC Press LLC.
4. John G. Webster, 2006, Encyclopedia Of Medical Devices and Instrumentation, Second Edition, John Wiley & Sons

3- Electronic Materials and Web Sites etc.:

Websites:

1. Medical Devices & Sensors Journal, Wiley. Peer reviewed academic journal in the field of Medical Devices. http://onlinelibrary.wiley.com/journal/2573802x
2. Journal of Medical Devices. Peer reviewed academic journal in the field of Medical Devices. http://medigitalcollection.asme.org/

Journals:

1. IEEE Transactions on Biomedical Engineering: Peer reviewed academic journal in the field of Biomedical Engineering. http://www.ieeexplore.ieee.org/xpl
2. Journal of Medical Devices. Peer reviewed academic journal in the field of Medical Devices https://publons.com/journal/19039/journal-of-medical-devices

Other Web Sources:

1. **Website: Franks Hospital Workshop**
2. http://www.frankshospitalworkshop.com

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

Faculty of Medical Technology

Department of Biomedical Engineering

Program of Biomedical Engineering

Course Plan (Syllabus) of

Biomedical Devices 1

Course Code. (07.02.716)

I. Information about Faculty Member Responsible for the Course:								
Name of Faculty Member:	Dr. Awadh Al-Kubati	Office Hours						
Location & Telephone No.:	21 September University of Medical and Applied Science 770807295							
E-mail:	dawadh@21umas.edu.ye	SAT	SUN	MON	TUE	WED	THU	

2024/2025

I. General Information:

11.	Course Title:	Biomedical Devices 1				
12.	Course Code:	07.02.716				
13.	Credit Hours:	Credit Hours	Theory Contact Hours		Practical Contact Hours	
			Lecture	Tutorial /Seminar	Lab	Clinical
		3	2	--	2	--
14.	Level/ Semester at which this Course is offered:	3rd Level / 1st Semester				
15.	Pre –Requisite (if any):	07.02.712				
16.	Co –Requisite (if any):	07.02.717				
17.	Program (s) in which the Course is Offered:	Bachelor of Biomedical Engineering				
18.	Language of Teaching the Course:	English/Arabic				
19.	Location of Teaching the Course:	Faculty of Medical Technology				
20.	Prepared by:	Dr. Mushtaq Alazazi				
11	Date and Number of Approval by Council:					

II. Course Description:

This course equips students with the fundamentals of medical devices used throughout a hospital. We'll delve into the core ideas behind these devices, explore how they function, and break down their inner workings using block diagrams from emergency rooms to intensive care units. The course includes: ventilator, anesthesia, patient monitor, defibrillator, electrosurgical devices, dialysis machine, infant incubator, infusion pumps and autoclave. The course focuses on practical activities related to operating, calibrations, troubleshooting, and maintenance of such equipment. By the end of this course, students will possess a solid foundation in the principles, operations, and inner workings of medical devices. This knowledge will empower students to better understand and appreciate the technological advancements that play a vital role in patient care across various hospital settings.

III. Course Intended Learning Outcomes (CILOs) :

Upon successful completion of the course, students will be able to:

	A. Knowledge and Understanding:
a1	Demonstrate a comprehensive understanding of the principles and

	functions of medical therapeutic and monitoring devices
a2	Understand biomedical equipment concepts, measurement techniques, maintenance, programming, and problem-solving to improve healthcare quality and device reliability
	B. Intellectual Skills:
b1	analyze problems, design innovative solutions, and optimize medical therapeutic equipment for accurate and efficient therapeutic and monitoring applications
b2	Assess the medical treatment and therapy devices according to their specifications and features.
	C. Professional and Practical Skills:
c1	Utilize a wide range of tools to solve complex problems in medical therapeutic and monitoring devices design for bringing innovative and technologically advanced solutions to life, ultimately improving diagnostic capabilities and patient care.
c2	Construct, operate and maintain the medical treatment and therapy devices by using rules and regulations of industrial safety.
	D. Transferable Skills:
d1	Function effectively in different work environments as an individual, and as a member or leader in multi-disciplinary teams.

IV. Course Contents:

A. Theoretical Aspect:

No.	Units/Topics List	Sub Topics List	Number of Weeks	Contact Hours
1	**Introduction to Medical therapeutic devices**	– Introduction to the course. – Course outlines. – Overview of biomedical Equipment and Classification – Principles of medical therapeutic devices – Basic design of therapeutic devices – Project description.	1	2
2	**Defibrillator**	– Introduction – Abnormal signals of ECG, – Purpose of Defibrillator – Operation principles of Defibrillator – Design, block diagram, and components of Defibrillator	1	2

No.	Units/Topics List	Sub Topics List	Number of Weeks	Contact Hours
		– Maintenance and troubleshooting of Defibrillator		
3	**Patient Monitor**	– Introduction and medical background on the bio-signal, – – Purpose of Patient Monitor – Operation principles of patient monitor – Design, block diagram, and components of patient monitor – Maintenance and troubleshooting of patient monitor	1	2
4	**Hemodialysis Machine**	- Introduction - Basic principles of Hemodialysis Machine - Purpose of Hemodialysis Machine -Operation principles of Hemodialysis Machine - Design, block diagram, and components of Hemodialysis Machine - Fluid removal: ultrafiltration - Cleaning and disinfection - Monitoring and control -Safety monitors in Hemodialysis – -Maintenance and troubleshooting of Hemodialysis machine	2	4
5	**Electrosurgical unit**	- Introduction and medical - background on the - electrosurgical unit - Operation principles of Electrosurgical unit - Design, block diagram, and components of Electrosurgical unit – Maintenance and troubleshooting of Electrosurgical unit	1	2
6	**Infusion Pump**	– Introduction – Purpose of Infusion pump – Operation principles of Infusion pump – Design, block diagram, and	1	2

No.	Units/Topics List	Sub Topics List	Number of Weeks	Contact Hours
		components of Infusion pump – Maintenance and troubleshooting of Infusion pump		
7	**Mid-Term Theoretical Exam**	– All Previous Topics	1	2
8	**Ventilator Machine**	– Introduction and medical – background on the respiration – in human, – Purpose of Ventilator machine – Operation principles of Ventilator machine – Design, block diagram, and components of Ventilator machine. – Ventilator modes, – Maintenance and troubleshooting of Ventilator machine	2	4
9	**Anesthesia Machine**	– Introduction and medical back – ground for anesthesia, – Purpose of Anesthesia machine – Types of medical gases used in anesthesia, – Operation principles of Anesthesia machine – Design, block diagram, and components of Anesthesia machine – Maintenance and troubleshooting of Anesthesia machine	2	4
10	**Biomedical Laser**	– Introduction – Types of Lasers – Purpose of Laser devices – Operation principles of Laser – Design, block diagram, and components of Laser device – Maintenance and troubleshooting of Laser device	1	2
11	**Dental chair**	– Introduction – Operation principles of Dental chair – Design, block diagram, and - components of Dental chair	1	2

No.	Units/Topics List	Sub Topics List	Number of Weeks	Contact Hours
		– Maintenance and troubleshooting of Dental chair		
12	Project Presentation	– Student's Presentation	1	2
13	Final Theoretical Exam	– All Topics	1	2
Number of Weeks /and Units Per Semester			16	32

B. Practical Aspect (Lab/Clinical) (if any):

No.	Tasks/ Experiments	Number of Weeks	Contact Hours
1	- Identifying the basic components of medical therapeutic devices. - Using practical examples to explain the basic design principles of therapeutic devices.	1	2
2	- Inspecting and understanding the components of a defibrillator. - Operating the defibrillator and observing responses on medical simulators. - Performing routine maintenance techniques.	1	2
3	- Connecting and operating a patient monitor. - Reading and analyzing vital signals (e.g., ECG, SpO2, blood pressure). - Maintenance and troubleshooting of monitoring devices.	1	2
4	- Setting up and operating a hemodialysis machine in a training lab. - Measuring flow rates and cleaning the machine following standard procedures. - Analyzing safety features of the monitoring systems.	1	2
5	- Operating and testing an electrosurgical unit. - Measuring the unit's power and efficiency using electronic measuring devices. - Maintenance and troubleshooting of the system.	1	2
6	- Connecting and operating an infusion pump. - Programming infusion rates and monitoring them	1	2

No.	Tasks/ Experiments	Number of Weeks	Contact Hours
	practically. - Applying maintenance procedures and diagnosing common errors.		
7	**Mid-Term Practical Exam**	1	2
8	- Setting up and operating a ventilator on a training dummy. - Adjusting various ventilation modes and observing their effects on biomodels. - Maintenance and troubleshooting of ventilators.	1	2
9	- Operating an anesthesia machine and understanding its core components. - Testing the gas system and monitoring pressure and flow. - Maintaining the gas system and ensuring safety.	1	2
10	- Operating a biomedical laser and using it on simulation materials. - Analyzing device performance by studying different laser effects. - Maintenance and inspection of laser systems.	1	2
11	- Operating the dental chair and inspecting its various systems (hydraulic and electrical). - Applying maintenance techniques and testing the system's efficiency.	1	2
12	- Preparing practical demonstrations of therapeutic device development projects. - Presenting real-world applications of medical devices used in hospitals.	1	2
13	**Final Practical Exam**	1	2
Number of Weeks /and Units Per Semester		**15**	**30**

VII. Assignments:

No.	Assignments	Week Due	Mark
1	**Assignment 1: Several Assignments on all topics learnt in the lectures.**	**W4-w8**	**2.5**
2	**Assignment 2: Several Assignments on all experiments learnt in the practical aspect.**	**W9-w15**	**2.5**
Total			**5**

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

No.	Assessment Method	Week Due	Mark	Proportion of Final Assessment
1	Assignments	Weekly	5	5%
2	Quizzes 1 & 2	Weeks 4,10	5	5%
3	Mid-Term Theoretical Exam	Week 8	10	10%
4	Mid-Term Practical Exam	Week 8	10	10%
5	Final Practical Exam including Project Presentation & Evaluation	Week 15	20	20%
6	Final Theoretical Exam	Week 16	50	50%
Total			100%	100%

IX. Learning Resources:

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

3. Ed. Joseph D. Bronzino, 2016, The Biomedical Engineering Handbook, Fourth Edition, CRC Press LLC.
3. Roger Narayan, 2019, Wiley Encyclopedia of Biomedical Engineering, Elsevier.

2- Essential References:

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4. John G. Webster, 2006, Encyclopedia Of Medical Devices and Instrumentation, Second Edition, John Wiley & Sons

3- Electronic Materials and Web Sites etc.:

Websites:

1. Medical Devices & Sensors Journal, Wiley. Peer reviewed academic journal in the field of Medical Devices. http://onlinelibrary.wiley.com/journal/2573802x
2. Journal of Medical Devices. Peer reviewed academic journal in the field of Medical Devices. http://medigitalcollection.asme.org/

Journals:

3. IEEE Transactions on Biomedical Engineering: Peer reviewed academic

journal in the field of Biomedical Engineering.
http://www.ieeexplore.ieee.org/xpl

4. Journal of Medical Devices. Peer reviewed academic journal in the field of Medical
Devices https://publons.com/journal/19039/journal-of-medical-devices

Other Web Sources:

3. **Website: Franks Hospital Workshop**
4. http://www.frankshospitalworkshop.com

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