University of Sana'a
Faculty of Engineering
Department: Biomedical Engineering
Title of the Program: Biomedical Engineering

Course Specification of Clinical Engineering

Course Code (BE366)

I. Course Identification and General Information:						
1	**Course Title:**	Clinical Engineering				
2	**Course Code & Number:**	BE366				
3	**Credit hours:**	C.H				TOTAL
		Th.	Seminar	Pr	Tr.	
		2	--	--	2	3
4	**Study level/ semester at which this course is offered:**	4th Level / 1st Semester				
5	**Pre –requisite (if any):**	None				
6	**Co –requisite (if any):**	None				
7	**Program (s) in which the course is offered:**	Biomedical Engineering Program				
8	**Language of teaching the course:**	English				
9	**Location of Teaching the Course:**	Faculty of Engineering				
10	**Prepared by:**	Dr. Waleed Altalabi				
11	**Reviewed by:**	Dr. Mohammed Alolofi				
12	**Date of Approval:**					

II. Course Description:

The course objective to provide students the need knowledge of clinical engineering, the role of the clinical engineer in any hospital, and to equip students with the major concepts of clinical engineering, life cycle management of medical equipment, development of analytical and problem-solving skills, understanding of safety controls in equipment operation, and the quality for the healthcare facilities. The course covers biomedical technology assessment, and the regulations to ensure the correct and safe use of biomedical technologies. The course is focusing primarily on applying biomedical engineering principles, systems, and management to technology being planned for or existing in the healthcare system.

III. Course Intended learning outcomes (CILOs) of the course (maximum 8CILOs)		**Referenced PILOs** (Only write code number of referenced Program Intended learning outcomes)
Knowledge and Understanding: Upon successful completion of the undergraduate Biomedical Engineering Program, the graduates will be able to:		
a1	Demonstrate a basic understanding of the clinical engineering profession – qualifications, roles, activities, and expectations.	A1 Describe and explain the underlying mathematical methods and theories; life scientific-principles; and engineering core concepts related to the Biomedical Engineering context.
a2	Identify the role of the clinical engineer in the hospital, explain the specifications of the hospitals, and illustrate the kinds of the hospitals and the medical sectors within any hospital.	A2 Clarify the design principles and techniques and the engineering materials characteristics and how these are relevant to the developments and technologies in a biomedical systems context.
a3	Comprehend the aspects of life cycle management for medical devices, and mention the differences between the technical and financial evaluation for the	A3 Recognize and explain the need for a high level of management, professional and ethical behavior, responsibility, quality assurance systems, codes of practice, standards, health and safety requirements, and environmental

	medical equipment.	impacts in biomedical systems.
B. Cognitive/ Intellectual Skills: Upon successful completion of the undergraduate Biomedical Engineering Program, the graduates will be able to:		
b1	Understanding the current trends, challenges and issues in healthcare technology and how clinical engineers can tackle them creatively and innovatively.	B4 Consider the principles of management and its various functions to work professionally in Biomedical Engineering fields.
b2	Analyze the distribution of the medical sectors with real hospitals, and recognize how to make technical and financial evaluation for the medical equipment.	B5 Distinguish the main characteristics of biomedical systems, apply diagnostic skills and technical knowledge and perform failure analysis to these systems.
C. Professional and Practical Skills: Upon successful completion of the undergraduate Biomedical Engineering Program, the graduates will be able to:		
c1	Use a wide range of the computer/IT tools relevant to the clinical engineering discipline along with an understanding of their processes and limitations, investigate technology related incidents and accidents, coordinate with medical staff, risk managers, and manufacturers to identify high risk technologies, investigate root causes of incidents, remediate technical and procedural deficiencies using failure modes and effects analysis, identify process improvements to advance patient safety,	C2 Use a wide range of analytical tools, techniques, IT, modern engineering tools, software packages and develop required computer programs to solve, modeling and analyzing Biomedical Engineering problems.

	and file reports with management, regulators, and other stakeholders.	
D. Transferable Skills: Upon successful completion of the undergraduate Biomedical Engineering Program, the graduates will be able to:		
d1	Lead healthcare technology implementation and improvement by working with clinicians and administrators to: Identify, solve clinical engineering problems.	D1 Lead and motivate individuals, show capability to work in stressful environments and within constraints, collaborate effectively within multidisciplinary team.
d2	Communicate and collaborate in teams to manage a range of biomedical projects. Write technical reports and manage time effectively.	D2 Acquire entrepreneurial skills and effectively manage tasks, time, processes and resources.

(A) Alignment Course Intended Learning Outcomes of Knowledge and Understanding to Teaching Strategies and Assessment Strategies:

Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
a1. Demonstrate a basic understanding of the clinical engineering profession – qualifications, roles, activities, and expectations.	• Interactive lectures & examples, • Tutorials, • Presentation/seminar, • Interactive class discussions, • Directed self- study.	• Written tests (mid and final terms and quizzes), • Home works and assignments, • Presentations.
a2. Identify the role of the clinical engineer in the hospital, explain the specifications of the hospitals, and illustrate the	• Interactive lectures & examples, • Presentation/seminar, • Interactive class	• Written tests (mid and final terms and quizzes), • Short reports,

kinds of the hospitals and the medical sectors within any hospital.	discussions, • Case studies, • Directed self- study, • Team work (cooperative learning), • Field visits/training.	• Home works and assignments, • Presentations.
a3. Comprehend the aspects of life cycle management for medical devices, and mention the differences between the technical and financial evaluation for the medical equipment.	• Interactive lectures & examples, • Tutorials, • Presentation/seminar, • Interactive class discussions, • Case studies, • Exercises and home works, • Workshops practices, • Directed self- study, • Team work (cooperative learning), • Field visits/training.	• Written tests (mid and final terms and quizzes), • Short reports, • Coursework activities assessment, • Home works and assignments, • Presentations.

(B) Alignment Course Intended Learning Outcomes of Intellectual Skills to Teaching Strategies and Assessment Strategies:		
Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
b1. Understanding the current trends, challenges and issues in healthcare technology and how clinical engineers can tackle them creatively and	• Interactive lectures & examples, • Presentation/seminar, • Interactive class discussions, • Directed self- study,	• Written tests (mid and final terms and quizzes), • Home works and assignments, • Presentations.

innovatively.	• Team work (cooperative learning).	
b2. Analyze the distribution of the medical sectors with real hospitals, and recognize how to make technical and financial evaluation for the medical equipment.	• Interactive lectures & examples, • Tutorials, • Presentation/seminar, • Interactive class discussions, • Case studies, • Workshops practices, • Directed self- study, • Team work (cooperative learning), • Field visits/training.	• Written tests (mid and final terms and quizzes), • Short reports, • Coursework activities assessment, • Home works and assignments, • Presentations.

(C) Alignment Course Intended Learning Outcomes of Professional and Practical Skills to Teaching Strategies and Assessment Strategies:

Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
c1. Use a wide range of the computer/IT tools relevant to the clinical engineering discipline along with an understanding of their processes and limitations, investigate technology related incidents and accidents, coordinate with medical staff, risk managers, and manufacturers to identify high risk technologies, investigate root causes of	• Interactive lectures & examples, • Presentation/seminar, • Interactive class discussions, • Computer laboratory-based sessions, • Workshops practices, • Directed self- study, • Team work (cooperative learning), • Field visits/training.	• Written tests (mid and final terms and quizzes), • Short reports, • Coursework activities assessment, • Home works and assignments, • Presentations.

incidents, remediate technical and procedural deficiencies using failure modes and effects analysis, identify process improvements to advance patient safety, and file reports with management, regulators, and other stakeholders.		

(D) Alignment Course Intended Learning Outcomes of Transferable Skills to Teaching Strategies and Assessment Strategies:		
Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
d1. Lead healthcare technology implementation and improvement by working with clinicians and administrators to: Identify, solve clinical engineering problems.	• Interactive lectures & examples, • Presentation/seminar, • Interactive class discussions, • Team work (cooperative learning).	• Written tests (mid and final terms and quizzes), • Presentations.
d2. Communicate and collaborate in teams to manage a range of biomedical projects. Write technical reports and manage time effectively.	• Interactive lectures & examples, • Presentation/seminar, • Interactive class discussions, • Team work (cooperative learning), • Field visits/training.	• Written tests (mid and final terms and quizzes), • Short reports, • Presentations.

IV. Course Content:

A – Theoretical Aspect:

Order	Units/Topics List	Sub Topics List	Number of Weeks	contact hours	Learning Outcomes
1	**Introduction**	– Introduction to the course. – Course outlines. – Project description. – History of engineering and technology in health care.	1	2	a1, b1
2	**The scope of Clinical Engineering (CE)**	– What is CE? – The role of CE. – Evolution of CE discipline. – Future of CE.	1	2	a1, a2
3	**The Health Care Environment**	– Introduction. – Medical and hospital management evolve. – Strategic planning for healthcare facilities. – Planning principles. – Components of technology planning. – Equipment planning for new facilities.	1	2	a2, b2, d2
4	**Biomedical Technology Assessment**	– Technology assessment. – Prerequisites for technology assessment. – Technology procurement. – Outsourcing CE Service.	1	2	a3, b1, d2, d1
5	**Medical Devices**	– Medical devices definition. – Medical devices classification.	3	6	a3, b2, c1, d2, d1

		– Certification process of medical devices. – Medical device life cycle management. – Equipment acquisition and deployment. – Process of acquiring technology. – Acquisition process strategies. – Maintenance and repair of medical devices. – Clinical team requirements.			
6	**Mid-Term Theoretical Exam**	– All previous topics.	1	2	a1, a2, a3, b1,
7	**Safety and Risk Management of Medical Equipment**	– A definition of risk management. – Historical perspective of risk management. – Strategies of risk management. – Application of risk management.	1	2	c1, d1
8	**Enhancing Patient Safety: The Role of Clinical Engineering**	– Patient safety. – Medical technology and patient safety. – The CE Careers, roles, and responsibilities. – CE at the bedside. – The clinical engineer as consultant. – The clinical engineer as investigator and expert witness.	1	2	a1, b1, c1, d2, d1
9	**Clinical quality**	– Clinical quality improvement (QI). – Quality culture and infrastructure.	1	2	d2, d1

		– Healthcare delivery principles. – QI priorities and infrastructure model. – QI in health technology management. – Service-Quality Improvement. – Linking health quality and health technology.			
10	**Medical Device Standards, Regulations, and the Law**	– Need for standards. – Standards Vs. Regulations. – National and international standards systems. – Identification and limitation of standards. – Standards and the clinical engineer. – Regulatory agencies. – JCAHO accreditation. – Healthcare quality and ISO 9001:2000. – Medical equipment management program and ANSI/AAMI EQ56. – Regulating medical devices.	2	4	b1, c1, d2, d1
11	**Project Presentation**	– Student's presentations.	2	4	a1, a2, a3, b1, c1, d1
12	**Final Theoretical Exam**	– All topics.	1	2	a1, a2, a3, b2, b1,
Number of Weeks /and Units Per Semester			**16**	**32**	

C. Tutorial Aspect:

No.	Tutorial	Number of Weeks	Contact Hours	Learning Outcomes (CILOs)
1	What are the latest researches in clinical engineering discipline?	2	4	a1, a2, b1
2	How the hospitals are classified?	1	2	a2, b2, d2
3	Explain what are the technology procurement methods, and how to select the appropriate method to use?	1	2	a3, b1, d2, d1
4	Desigen a mini project for medical devices life cycle management.	4	8	a3, b2, c1, d2, d1
5	Classified the medical risk.	1	2	c1, d1
6	How clinical engineer enhance patient safety?	1	2	a1, b1, c1, d2, d1
7	What is CQI?	1	2	d2, d1
8	Compare between national (If any) and international standards system for medical devices? Propose a national standard system, or update the exist one.	3	6	b1, c1, d2, d1
9	Final Practical Exam (Projects and tasks Decision)	1	2	a1, a2, a3, b1, c1, d1
Number of Weeks /and Units Per Semester		**15**	**30**	

V. Teaching Strategies of the Course:

- Interactive lectures & examples,
- Tutorials,
- Presentation/seminar,
- Interactive class discussions,
- Case studies,
- Exercises and home works,
- Computer laboratory-based sessions,
- Workshops practices,
- Directed self- study,
- Team work (cooperative learning),
- Field visits/training.

VI. Assessment Methods of the Course:

- Written tests (mid and final terms and quizzes),
- Short reports,
- Coursework activities assessment,
- Home works and assignments,
- Presentations.

VII. Assignments:

No	Assignments	Aligned CILOs(symbols)	Week Due	Mark
1	Lectures 1,2,3, and 4 Assignment	a1, a2, a3, b2, b1, d2, d1	5	6
2	Lectures 5,6,7, and 9 Assignment	a3, b2, c1, d2, d1	10	7
3	Lectures 10,11,12, and 13 Assignment	a1, b1, c1, d2, d1	14	7
4	Project/ Presentation	a1, a2, a3, b1, c1, d1	15	10

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	Project/ Assignments	5,10,14,15	30	20%	a1, a2, a3, b2, b1, c1, d2, d1
2	Quiz 1	4	10	6.67%	a1, a2, a3, b1
3	Midterm Exam	8	30	20%	a1, a2, a3, b1,
4	Quiz 2	12	10	6.67%	a3, b2, b1,
5	Final Exam	16	70	46.67%	a1, a2, a3, b2, b1,
Total			150	100%	

IX. Learning Resources:

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

1. Ernesto Iadanza, 2020, "**Clinical Engineering Handbook**", 2nd Ed., USA, Elsevier Academic Press.
2. Yadin David, Wolf W.Von Maltzahn, Michael R.Neuman, Joseph D.Bronzino., 2005, "**Clinical Engineering: Principles and Applications in Engineering**", USA, Taylor & Francis, CRC press.

2- Essential References.

1. Joseph F. Dyro, 2004, "**The Clinical Engineering Handbook**", USA, Elsevier Academic Press.
2. Azzam Taktak, Paul Ganney. Dave Long, Paul white, 2014, "**Clinical Engineering: A Handbook for Clinical and Biomedical Engineers**",1st Ed., USA, Elsevier Academic Press.

3- Electronic Materials and Web Sites *etc*.

Websites:

1- A pool for biomedical professional to discuss and share their knowledge and experiences among each other.
https://www.clinicalengineeringbank.com/apps/forums/

2- Biomedical and clinical engineering forums.
https://www.ebme.co.uk/forums/

3- The New England Society of Clinical Engineering (NESCE) is a not-for-profit, educational organization focused on medical technology management and its impact on improving patient care.
https://nesce.org/

Journals:

1- This quarterly journal keeps hospital clinical engineers, biomedical equipment technicians, health care planners and consultants current on topics including industry trends and developments, clinical engineering management, FDA regulation, quality control, legal developments, device management and biomedical assessment.
https://journals.lww.com/jcejournal/pages/default.aspx

2- Global Clinical Engineering Journal, the d**iamond** *open access* publishes high quality, timely, peer-reviewed manuscripts about the intersection of technology, engineering and informatics related to health, wellness, disease management, and patient-care outcomes around the world.
https://www.globalce.org/index.php/GlobalCE

Other Web Sources:

1- The Mission of the Clinical Engineering Society of Ontario (CESO) is to represent, advocate and provide educational and networking opportunities for Clinical Engineers and Biomedical Engineering.
https://www.ceso.on.ca/

2- CMBES/SCGB hosts a discussion forum for those in the Biomedical and Clinical Engineering industry to post questions and discuss issues relevant to the profession in an open forum.
https://www.cmbes.ca/clinical-biomedical-engineering/cmbes-discussion-forum

X. Course Policies:

1	**Class Attendance:** A student should attend not less than 75 % of total hours of the subject; otherwise he/she will not be able to take the exam and will be considered as exam failure. If the student is absent due to illness, he/she should bring a proof statement from university Clinic. If the absent is more than 25% of a course total contact hours, student will be required to retake the entire course again.
2	**Tardy:** For late in attending the class, the student will be initially notified. If he repeated lateness in attending class, he/she will be considered as absent.
3	**Exam Attendance/Punctuality:** A student should attend the exam on time. He/she is permitted to attend an exam half one hour from exam beginning, after that he/she will not be permitted to take the exam and he/she will be considered as absent in exam
4	**Assignments & Projects**: In general one assignment is given to the students after each chapter; the student has to submit all the assignments for checking on time, mostly one week after given the assignment.
5	**Cheating**: For cheating in exam, a student will be considered as fail. In case the cheating is repeated three times during his/her study the student will be disengaged from the Faculty.
6	**Plagiarism**: Plagiarism is the attending of a student the exam of a course instead of another student. If the examination committee proofed a plagiarism of a student, he/she will be disengaged from the Faculty. The final disengagement of the student from the Faculty should be confirmed from the Student Council Affair of the university or according to the university roles.
7	**Other policies**:

	- Mobile phones are not allowed to use during a class lecture. It must be closed; **otherwise** the student will be asked to leave the lecture room. - Mobile phones are not allowed in class during the examination. - Lecture notes and assignments might be given directly to students using soft or hard copy.

University of Sana'a
Faculty of Engineering
Department: Biomedical Engineering
Title of the Program: Biomedical Engineering

Template for Course Plan (Syllabus)

Clinical Engineering
BE366

I. Course Identification and General Information:					
1	**Course Title:**	Clinical Engineering			
2	**Course Code & Number:**	BE366			
3	**Credit Hours:**	**Credit Hours**	**Theory Hours**		**Lab. Hours**
			Lecture	**Exercise**	
		3	2	2	--
4	**Study Level/ Semester at which this Course is offered:**	4^{th} Level / 1^{st} Semester			
5	**Pre –Requisite (if any):**	None			
6	**Co –Requisite (if any):**	None			
7	**Program (s) in which the Course is Offered:**	Bachelor of Biomedical Engineering			
8	**Language of Teaching the Course:**	English			
9	**Location of Teaching the Course:**	Faculty of Engineering			
10	**Prepared by:**	Dr. Waleed Altalabi			
11	**Reviewed by:**	Dr. Mohammed Alolofi			
12	**Date of Approval:**				

II. Course Description:

The course objective to provide students the need knowledge of clinical engineering, the role of the clinical engineer in any hospital, and to equip students with the major concepts of clinical engineering, life cycle management of medical equipment, development of analytical and problem-solving skills, understanding of safety controls in equipment operation, and the quality for the healthcare facilities. The course covers biomedical technology assessment, and the regulations to ensure the correct and safe use of biomedical technologies. The course is focusing primarily on applying biomedical engineering principles, systems, and management to technology being planned for or existing in the healthcare system.

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	Demonstrate a basic understanding of the clinical engineering profession – qualifications, roles, activities, and expectations.
a2	Identify the role of the clinical engineer in the hospital, explain the specifications of the hospitals, and illustrate the kinds of the hospitals and the medical sectors within any hospital.
a3	Comprehend the aspects of life cycle management for medical devices, and mention the differences between the technical and financial evaluation for the medical equipment.
B. Intellectual Skills: Upon successful completion of the course, students will be able to:	
b1	Understanding the current trends, challenges and issues in healthcare technology and how clinical engineers can tackle them creatively and innovatively.
b2	Analyze the distribution of the medical sectors with real hospitals, and recognize how to make technical and financial evaluation for the medical equipment.
C. Professional and Practical Skills: Upon successful completion of the course, students will be able to:	
c1	Use a wide range of the computer/IT tools relevant to the clinical engineering discipline along with an understanding of their processes and limitations, investigate technology related incidents and accidents, coordinate with medical staff, risk managers, and manufacturers to

III. Course Intended Learning Outcomes (CILOs): (مخرجات تعلم المقرر)	
	identify high risk technologies, investigate root causes of incidents, remediate technical and procedural deficiencies using failure modes and effects analysis, identify process improvements to advance patient safety, and file reports with management, regulators, and other stakeholders.
D. Transferable Skills: Upon successful completion of the course, students will be able to:	
d1	Lead healthcare technology implementation and improvement by working with clinicians and administrators to: Identify, solve clinical engineering problems.
d2	Communicate and collaborate in teams to manage a range of biomedical projects. Write technical reports and manage time effectively.

IV. Course Contents:

A. Theoretical Aspect:

No.	Units/Topics List	Sub Topics List	Number of Weeks	Contact Hours
1	**Introduction**	– Introduction to the course. – Course outlines. – Project description. – History of engineering and technology in health care.	1	2
2	**The scope of Clinical Engineering (CE)**	– What is CE? – The role of CE. – Evolution of CE discipline. – Future of CE.	1	2
3	**The Health Care Environment**	– Introduction. – Medical and hospital management evolve. – Strategic planning for healthcare facilities.	1	2

IV. Course Contents:

A. Theoretical Aspect:

No.	Units/Topics List	Sub Topics List	Number of Weeks	Contact Hours
		– Planning principles. – Components of technology planning. – Equipment planning for new facilities.		
4	**Biomedical Technology Assessment**	– Technology assessment. – Prerequisites for technology assessment. – Technology procurement. – Outsourcing CE Service.	1	2
5	**Medical Devices**	– Medical devices definition. – Medical devices classification. – Certification process of medical devices. – Medical device life cycle management. – Equipment acquisition and deployment. – Process of acquiring technology. – Acquisition process strategies. – Maintenance and repair of medical devices. – Clinical team requirements.	3	6
6	**Mid-Term Theoretical Exam**	All previous topics.	1	2
7	**Safety and Risk Management of Medical Equipment**	– A definition of risk management. – Historical perspective of risk management. – Strategies of risk management. – Application of risk management.	1	2

IV. Course Contents:

A. Theoretical Aspect:

No.	Units/Topics List	Sub Topics List	Number of Weeks	Contact Hours
8	**Enhancing Patient Safety: The Role of Clinical Engineering**	– Patient safety. – Medical technology and patient safety. – The CE Careers, roles, and responsibilities. – CE at the bedside. – The clinical engineer as consultant. – The clinical engineer as investigator and expert witness.	1	2
9	**Clinical quality**	– Clinical quality improvement (QI). – Quality culture and infrastructure. – Healthcare delivery principles. – QI priorities and infrastructure model. – QI in health technology management. – Service-Quality Improvement. – Linking health quality and health technology.	1	2
10	**Medical Device Standards, Regulations, and the Law**	– Need for standards. – Standards Vs. Regulations. – National and international standards systems. – Identification and limitation of standards. – Standards and the clinical engineer. – Regulatory agencies. – JCAHO accreditation. – Healthcare quality and ISO 9001:2000.	2	4

IV. Course Contents:

A. Theoretical Aspect:

No.	Units/Topics List	Sub Topics List	Number of Weeks	Contact Hours
		– Medical equipment management program and ANSI/AAMI EQ56. – Regulating medical devices.		
11	**Project Presentation**	– Student's presentations.	2	4
12	**Final Theoretical Exam**	All topics.	1	2
Number of Weeks /and Units Per Semester			**16**	**32**

C. Tutorial Aspect:

No.	Tutorial	Number of Weeks	Contact Hours
1	What are the latest researches in clinical engineering discipline?	2	4
2	How the hospitals are classified?	1	2
3	Explain what are the technology procurement methods, and how to select the appropriate method to use?	1	2
4	Desigen a mini project for medical devices life cycle management.	4	8
5	Classified the medical risk.	1	2
6	How clinical engineer enhance patient safety?	1	2
7	What is CQI?	1	2
8	Compare between national (If any) and international	3	6

C. Tutorial Aspect:			
No.	**Tutorial**	**Number of Weeks**	**Contact Hours**
	standards system for medical devices? Propose a national standard system, or update the exist one.		
9	Final Practical Exam (Projects and tasks Decision)	1	2
Number of Weeks /and Units Per Semester		**15**	**30**

V. Teaching Strategies of the Course:

- Interactive lectures & examples,
- Tutorials,
- Presentation/seminar,
- Interactive class discussions,
- Case studies,
- Exercises and home works,
- Computer laboratory-based sessions,
- Workshops practices,
- Directed self- study,
- Team work (cooperative learning),
- Field visits/training.

VI. Assessment Methods of the Course:

- Written tests (mid and final terms and quizzes),
- Short reports,
- Coursework activities assessment,
- Home works and assignments,
- Presentations.

VII. Assignments:

No.	Assignments	Week Due	Mark
1	**Lectures 1,2,3, and 4 Assignment**	5	**6**
2	**Lectures 5,6,7, and 9 Assignment**	10	**7**
3	**Lectures 10,11,12, and 13 Assignment**	14	**7**
4	**Project/ Presentation**	15	**10**
Total			**30**

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

No.	Assessment Method	Week Due	Mark	Proportion of Final Assessment
1	**Project/ Assignments**	5,10,14, 15	30	20%
2	**Quiz 1**	4	10	6.67%
3	**Midterm Exam**	8	30	20%
4	**Quiz 2**	12	10	6.67%
5	**Final Exam**	16	70	46.67%
Total			**150**	**100%**

IX. Learning Resources:

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

1. Ernesto Iadanza, 2020, "**Clinical Engineering Handbook**", 2nd Ed., USA, Elsevier Academic Press.
2. Yadin David, Wolf W.Von Maltzahn, Michael R.Neuman, Joseph D.Bronzino., 2005, "**Clinical Engineering: Principles and Applications in Engineering**", USA, Taylor & Francis, CRC press.

2- Essential References.	
	1. Joseph F. Dyro, 2004, "**The Clinical Engineering Handbook**", USA, Elsevier Academic Press. 2. Azzam Taktak, Paul Ganney. Dave Long, Paul white, 2014, "**Clinical Engineering: A Handbook for Clinical and Biomedical Engineers**",1st Ed., USA, Elsevier Academic Press.
3- Electronic Materials and Web Sites *etc*.	
	Websites: 1- A pool for biomedical professional to discuss and share their knowledge and experiences among each other. https://www.clinicalengineeringbank.com/apps/forums/ 2- Biomedical and clinical engineering forums. https://www.ebme.co.uk/forums/ 3- The New England Society of Clinical Engineering (NESCE) is a not-for-profit, educational organization focused on medical technology management and its impact on improving patient care. https://nesce.org/ **Journals:** 1- This quarterly journal keeps hospital clinical engineers, biomedical equipment technicians, health care planners and consultants current on topics including industry trends and developments, clinical engineering management, FDA regulation, quality control, legal developments, device management and biomedical assessment. https://journals.lww.com/jcejournal/pages/default.aspx 2- Global Clinical Engineering Journal, the d**iamond** *open access* publishes high quality, timely, peer-reviewed manuscripts about the intersection of technology, engineering and informatics related to health, wellness, disease management, and patient-care outcomes around the world. https://www.globalce.org/index.php/GlobalCE **Other Web Sources:** 1- The Mission of the Clinical Engineering Society of Ontario (CESO) is to represent, advocate and provide educational and networking opportunities for Clinical Engineers and Biomedical Engineering.

	https://www.ceso.on.ca/ 2- CMBES/SCGB hosts a discussion forum for those in the Biomedical and Clinical Engineering industry to post questions and discuss issues relevant to the profession in an open forum. https://www.cmbes.ca/clinical-biomedical-engineering/cmbes-discussion-forum

X. Course Policies:

1	**Class Attendance:** A student should attend not less than 75 % of total hours of the subject; otherwise he/she will not be able to take the exam and will be considered as exam failure. If the student is absent due to illness, he/she should bring a proof statement from university Clinic. If the absent is more than 25% of a course total contact hours, student will be required to retake the entire course again.
2	**Tardy:** For late in attending the class, the student will be initially notified. If he repeated lateness in attending class, he/she will be considered as absent.
3	**Exam Attendance/Punctuality:** A student should attend the exam on time. He/she is permitted to attend an exam half one hour from exam beginning, after that he/she will not be permitted to take the exam and he/she will be considered as absent in exam
4	**Assignments & Projects:** In general one assignment is given to the students after each chapter; the student has to submit all the assignments for checking on time, mostly one week after given the assignment.
5	**Cheating:** For cheating in exam, a student will be considered as fail. In case the cheating is repeated three times during his/her study the student will be disengaged from the Faculty.
6	**Plagiarism:**

	Plagiarism is the attending of a student the exam of a course instead of another student. If the examination committee proofed a plagiarism of a student, he/she will be disengaged from the Faculty. The final disengagement of the student from the Faculty should be confirmed from the Student Council Affair of the university or according to the university roles.
7	**Other policies**: - Mobile phones are not allowed to use during a class lecture. It must be closed; **otherwise** the student will be asked to leave the lecture room. - Mobile phones are not allowed in class during the examination. - Lecture notes and assignments might be given directly to students using soft or hard copy.