



Elective Course (1)

Course Specification of Introduction to Biomedical Technology

I. Course Identification and General Information:						
1.	Course Title:	Introduction to Biomedical Technology.				
2.	Course Code & Number:	MT310.				
3.	Credit hours:	C.H				Total Cr. Hrs.
		Th.	Seminar	Pr.	Tu.	
		2	-		2	
4.	Study level/ semester at which this course is offered:	Fourth Year - Second Semester.				
5.	Pre –requisite (if any):	None.				
6.	Co –requisite (if any):	None.				
7.	Program (s) in which the course is offered:	Mechatronics Engineering Program.				
8.	Language of teaching the course:	English Language.				
9.	Location of teaching the course:	Mechatronics Engineering Department.				
10.	Prepared By:	Dr. Mohammed Abdullah Al-Olofi				
11.	Date of Approval:					

II. Course Description:

This course aims to advance student knowledge with the basic principles, concepts, and theories of the biomedical engineering and its applications in medical fields.

It includes a historical perspective of biomedical engineering BME, jobs carries in BME, area of research & development in BME, process of design commercial medical devices, basic components of medical instruments, biomedical sensors “biosensors”, bioinstrumentation, bio signal processing, biotechnology, and tissue engineering.

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III. Course Intended learning outcomes (CILOs) of the course		Referenced PILOs
a.1	Recognize the principles, concepts, and theories of biomedical engineering.	A1
a.2	Describe the theories of operations of medical equipment systems.	A2
a.3	Depict characteristics of biomedical systems and specifications related to Mechatronics.	A4
a.4	Classify the biomedical engineer responsibilities, and Biomedical practices safety issues.	A6
b.1	Categorize the biomedical engineering issues and analyze the available solutions.	B1
b.2	Examine innovate methods for monitoring, interfacing and automating of biomedical systems.	B3
c.1	Choose the information technology tools to solve the biomedical systems problems.	C2
d.1	Cooperate productively as an individual and as a member of a team / multi-disciplinary team.	D1
d.2	Rate effectively project tasks, time and resources.	D3
d.3	Judge in independent lifelong learning.	D5
d.4	Review effective technical reports and presentations.	D6

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

Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
a.1 Recognize the principles, concepts, and theories of biomedical engineering.	<ul style="list-style-type: none"> • Active Lectures. • Tutorials 	<ul style="list-style-type: none"> • Written Assessment. • Short Essays. • Final Exam.
a.2 Describe the theories of operations of medical equipment systems.	<ul style="list-style-type: none"> • Hands on Laboratory Work • Lectures 	<ul style="list-style-type: none"> • Practical Assessment. • Simulation. • Final Exam.
a.3 Depict characteristics of biomedical systems and specifications related to Mechatronics.	<ul style="list-style-type: none"> • Case Studies. • Independent Learning and Work. • Lectures 	<ul style="list-style-type: none"> • Short Essays. • Project Reports. • Final Exam. • Assessment
a.4 Classify the biomedical engineer responsibilities, and Biomedical practices safety issues.	<ul style="list-style-type: none"> • Independent Learning and Work. • Work. • Lectures 	<ul style="list-style-type: none"> • Project Reports. • Final Exam. • Assessment

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

Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
b.1 Categorize the biomedical engineering issues and analyze the available solutions.	<ul style="list-style-type: none"> • Design Work and Project. • Case Studies • Lectures 	<ul style="list-style-type: none"> • Practical Assessment. • Reports. • Final Exam.

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b.2 Examine innovate methods for monitoring, interfacing and automating of biomedical systems.	<ul style="list-style-type: none"> • Active Lectures. • Independent • Learning and • Work. 	<ul style="list-style-type: none"> • Simulations. • Presentations. • Final Exam. • Assessment
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© Alignment Course Intended Learning Outcomes of Professional and Practical Skills to Teaching Strategies and Assessment Strategies:		
Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
c.1 Choose the information technology tools to solve the biomedical systems problems.	<ul style="list-style-type: none"> • The Use of Communication and Information Technology. • Lectures 	<ul style="list-style-type: none"> • Simulations such as Computer Based Learning. • Final Exam.

(D) Alignment Course Intended Learning Outcomes of Transferable Skills to Teaching Strategies and Assessment Strategies:		
Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
d.1 Cooperate productively as an individual and as a member of a team / multi-disciplinary team.	<ul style="list-style-type: none"> • Group Learning. 	<ul style="list-style-type: none"> • Project Reports.
d.2 Rate effectively project tasks, time and resources.	<ul style="list-style-type: none"> • Active Lectures. 	<ul style="list-style-type: none"> • Presentations.
d.3 Judge in independent lifelong learning.	<ul style="list-style-type: none"> • Active Lectures. 	<ul style="list-style-type: none"> • Presentations.
d.4 Review effective technical reports and presentations.	<ul style="list-style-type: none"> • Active Lectures. 	<ul style="list-style-type: none"> • Presentations. • Written Assessments.

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IV. Course Content:					
A – Theoretical Aspect:					
Order	Units/Topics List	Learning Outcomes	Sub Topics List	Number of Weeks	Contact hours
1.	Introduction to Biomedical Engineering (BME).	a.1, a.2, a.3, a.4	<ul style="list-style-type: none"> • A historical perspective of biomedical engineering BME. • Jobs carries in BME. • Area of research & development in BME. 	2	4
2.	BME Fields.	a.1, a.2, a.3, a.4, b.1, b.2, c.1	<ul style="list-style-type: none"> • Types. • Application. • Basic components of medical instruments. • Biosensors. • Bio instrument • Biosignal processing. • Biotechnology. • Tissue engineering – biomaterials. • Radiation imaging – biomedical optics and lasers. • Clinical engineering. • Electrical safety. 	7	14
3.	Mid-Term Exam.	a1, a2, a3, a4, b1, b2, c1.	<ul style="list-style-type: none"> • The first 2 chapters. 	1	2
4.	Medical Devices.	a.1, a.2, a.3, a.4, b.1, b.2, c.1	<ul style="list-style-type: none"> • Basic components of medical instruments • Biomedical sensors • Bioinstrumentation 	4	8

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			<ul style="list-style-type: none"> • Biotechnology • Tissue engineering 		
5.	Final Report Presentation.	a1, a2, a3, a4, b1,b2, c1, d1, d2, d3, d4.	All the chapters.	1	2
6.	Final Exam.	a1, a2, a3, a4, b1, b2, c1.	All the chapters.	1	2
Number of Weeks /and Units Per Semester				16	32

B – Tutorial Aspect:				
Order	Tasks/ Experiments	Number of Weeks	contact hours	Learning Outcomes
1	Introduction to Biomedical Engineering (BME).	2	4	a.1, a.2, a.3, a.4
2	BME Fields.	7	14	a.1, a.2, a.3, a.4, b.1, b.2, c.1
3	Medical Devices.	4	8	a.1, a.2, a.3, a.4, b.1, b.2, c.1
4	Final Report Presentation.	1	2	a1, a2, a3, a4, b1,b2, c1, d1, d2, d3, d4.
Number of Weeks /and Units Per Semester: 14			28	

V. Teaching strategies of the course:
In general, teaching and learning in undergraduate engineering education programs should use a variety of teaching methods, such as: <ul style="list-style-type: none"> • Active Lectures (supported with discussions).

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- Hands-on Laboratory Work.
- Independent Learning and Work.
- Group Learning and Problem-Based Learning.
- Field Classes.
- Independent Applications of Engineering Analysis.
- Seminars, Journal Clubs and Workshops.
- The Use of Communication and Information Technology.
- Computer and Web-Based Learning.
- Case Studies.

VI. Assignments:

No	Assignments	Aligned CILOs(symbols)	Week Due	Mark
1	Exercises & Home works (all the chapters-Tutorials)	a.1, a.2, a.3, a.4, b.1, b.2,d.1, d.3	Weekly	10
2	Project (single\group)	a1, a2, a3, a4, b1,b2, c1, d1, d2, d3, d4.	Quarter	5
3	Participation	a1, a2, a3, a4, b1,b2, c1, d1, d2, d3, d4.	Weekly	5
Total				20

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

No.	Assessment Method	Week Due	Mark	Proportion of Final Assessment	Aligned Course Learning Outcomes
1.	Assessment (Tutorials)	Weekly	15	10%	a.1, a.2, a.3, a.4, b.1, b.2,d.1, d.3
2.	Project (single\group)	Quarter	7.5	5%	a1, a2, a3, a4, b1, b2, c1, d1, d2, d3, d4
3.	Participation & Presentation	Weekly	7.5	5%	a1, a2, a3, a4, b1, b2, c1, d1, d2, d3, d4

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4.	Mid-term Exam.	Week 10	15	10%	a1, a2, a3, a4, b1, b2, c1
5.	Final Exam.	Week 16	105	70%	a1, a2, a3, a4, b1, b2, c1
Total			150	100%	

VIII. Learning Resources:

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

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

- John Enderle, et al. “Introduction to Biomedical Engineering”, 2nd ed., Academic Press.

2- Essential References.

- BME Handbook

3- Electronic Materials and Web Sites etc.

1. <http://www.sciencedirect.com/>
2. <http://dl.acm.org/dl.cfm>
3. <http://ieeexplore.ieee.org/Xplore/guesthome.jsp>
4. <http://www.emeraldinsight.com>
5. <http://www.scopus.com/home.url>
6. <http://link.springer.com/>

IX. Course Policies:

1	<p>Class Attendance:</p> <p>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</p>
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	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

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	confirmed from the Student Council Affair of the university or according to the university roles.
7	<p>Other policies:</p> <ul style="list-style-type: none"> - 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.

Reviewed By	Vice Dean for Academic Affairs and Post Graduate Studies: Dr. Tarek A. Barakat President of Quality Assurance Unit: Ass. Prof. Dr. Mohammed Algorafi Head of Mechatronics Engineering Department: Ass. Prof. Dr. Abdul-Malik Momin
	Deputy Rector for Academic Affairs Dr. Ibrahim AlMutaa Ass. Prof. Dr. Ahmed Mujahed Dr. Munaser Alsubri

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Elective Course (1)

Template for Course Plan of Introduction to Biomedical Technology

I. Information about Faculty Member Responsible for the Course:							
Name of Faculty Member	Dr. Mohammed Abdullah Al-Olofi	Office Hours					
Location & Telephone No.	00967-773703712	SAT	SUN	MON	TUE	WED	THU
E-mail	Al_olfe2001@yahoo.com	8-10					

II. Course Identification and General Information:						
1-	Course Title:	Introduction to Biomedical Technology.				
2-	Course Number & Code:	MT310.				
3-	Credit hours:	C.H				Total Cr. Hrs.
		Th.	Seminar	Pr.	Tu.	
		2	-	-	2	3
4-	Study level/year at which this course is offered:	Fourth Year – Second Semester.				
5-	Pre –requisite (if any):	None.				
6-	Co –requisite (if any):	None.				
7-	Program (s) in which the course is offered	Mechatronics Engineering Program.				
8-	Language of teaching the course:	English Language.				
9-	System of Study:	Semesters.				
10-	Mode of delivery:	Lectures and Tutorials.				
11-	Location of teaching the course:	Mechatronics Engineering Department.				

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III. Course Description:

This course aims to advance student knowledge with the basic principles, concepts, and theories of the biomedical engineering and its applications in medical fields.

It includes a historical perspective of biomedical engineering BME, jobs carries in BME, area of research & development in BME, process of design commercial medical devices, basic components of medical instruments, biomedical sensors “biosensors”, bioinstrumentation, bio signal processing, biotechnology, and tissue engineering.

IV. Course Intended learning outcomes (CILOs) of the course		Referenced PILOs
a.1	Recognize the principles, concepts, and theories of biomedical engineering.	A1
a.2	Describe the theories of operations of medical equipment systems.	A2
a.3	Depict characteristics of biomedical systems and specifications related to Mechatronics.	A4
a.4	Classify the biomedical engineer responsibilities, and Biomedical practices safety issues.	A6
b.1	Categorize the biomedical engineering issues and analyze the available solutions.	B1
b.2	Examine innovate methods for monitoring, interfacing and automating of biomedical systems.	B3
c.1	Choose the information technology tools to solve the biomedical systems problems.	C2
d.1	Cooperate productively as an individual and as a member of a team / multi-disciplinary team.	D1

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d.2	Rate effectively project tasks, time and resources.	D3
d.3	Judge in independent lifelong learning.	D5
d.4	Review effective technical reports and presentations.	D6

V. Course Content:

- Distribution of Semester Weekly Plan of Course Topics/Items and Activities.

A – Theoretical Aspect:

Order	Units/Topics List	Sub Topics List	Number of Weeks	Contact hours
1.	Introduction to Biomedical Engineering (BME).	<ul style="list-style-type: none"> • A historical perspective of biomedical engineering BME. • Jobs carries in BME. • Area of research & development in BME. 	1,2	4
2.	BME Fields.	<ul style="list-style-type: none"> • Types. • Application. • Basic components of medical instruments. • Biosensors. • Bioinstrument • Biosignal processing. • Biotechnology. • Tissue engineering – biomaterials. • Radiation imaging – biomedical optics and lasers. • Clinical engineering. • Electrical safety. 	3,4,5,6,7,8,9	14

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3.	Mid-Term Exam.	<ul style="list-style-type: none"> The first 2 chapters. 	10	2
4.	Medical Devices.	<ul style="list-style-type: none"> Basic components of medical instruments Biomedical sensors Bioinstrumentation Biotechnology Tissue engineering 	11,12,13,14	8
5.	Final Report Presentation.	All the chapters.	15	2
6.	Final Exam	All the chapters.	16	2
Number of Weeks /and Units Per Semester			16	32

B – Tutorial Aspect:				
Order	Tasks/ Experiments	Number of Weeks	contact hours	Learning Outcomes
1	Introduction to Biomedical Engineering (BME).	1,2	4	a.1, a.2, a.3, a.4
2	BME Fields.	3,4,5,6,7,8,9	14	a.1, a.2, a.3, a.4, b.1, b.2, c.1
3	Medical Devices.	10,11,12,13	8	a.1, a.2, a.3, a.4, b.1, b.2, c.1
4	Final Report Presentation.	14	2	a1, a2, a3, a4, b1,b2, c1, d1, d2, d3, d4.
Number of Weeks /and Units Per Semester: 14			28	

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VI. Teaching strategies of the course:

In general, teaching and learning in undergraduate engineering education programs should use a variety of teaching methods, such as:

- Active Lectures (supported with discussions).
- Hands-on Laboratory Work.
- Independent Learning and Work.
- Group Learning and Problem-Based Learning.
- Field Classes.
- Independent Applications of Engineering Analysis.
- Seminars, Journal Clubs and Workshops.
- The Use of Communication and Information Technology.
- Computer and Web-Based Learning.
- Case Studies.

VII. Assignments:

No	Assignments	Aligned CIOs(symbols)	Week Due	Mark
1.	Exercises & Home works (all the chapters)	a.1, a.2, a.3, a.4, b.1, b.2,d.1, d.3	Weekly	10
2.	Project (single\group)	a1, a2, a3, a4, b1,b2, c1, d1, d2, d3, d4.	Quarter	5
3.	Participation	a1, a2, a3, a4, b1,b2, c1, d1, d2, d3, d4.	Weekly	5
Total				20

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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.	Assessment	Weekly	15	10%	a.1, a.2, a.3, a.4, b.1, b.2, d.1, d.3
2.	Project (single/group)	Quarter	7.5	5%	a1, a2, a3, a4, b1, b2, c1, d1, d2, d3, d4.
3.	Participation & Presentation	Weekly	7.5	5%	a1, a2, a3, a4, b1, b2, c1, d1, d2, d3, d4.
4.	Mid-Term Exam.	Week 10	15	10%	a1, a2, a3, a4, b1, b2, c1, d1, d2, d3, d4.
5.	Final Exam.	Week 16	105	70%	a1, a2, a3, a4, b1, b2, c1, d1, d2, d3, d4.
Total			150	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).

- John Enderle, et al. "Introduction to Biomedical Engineering", 2nd ed., Academic Press.

2- Essential References.

- BME Handbook

3- Electronic Materials and Web Sites etc.

1. <http://www.sciencedirect.com/>
2. <http://dl.acm.org/dl.cfm>
3. <http://ieeexplore.ieee.org/Xplore/guesthome.jsp>
4. <http://www.emeraldinsight.com>
5. <http://www.scopus.com/home.url>
6. <http://link.springer.com/>

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X. Course Policies:	
1	<p>Class Attendance:</p> <p>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.</p>
2	<p>Tardy:</p> <p>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.</p>
3	<p>Exam Attendance/Punctuality:</p> <p>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</p>
4	<p>Assignments & Projects:</p> <p>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.</p>
5	<p>Cheating:</p>

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	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	<p>Plagiarism:</p> <p>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.</p>
7	<p>Other policies:</p> <ul style="list-style-type: none"> - 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.

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