Biomedical Engineering Program Specification

1- Course Specification of Mathematics (3)

I.Course Identification and General Information:

1.	Course Title:	Mathematics (3).				
2.	Course Code & Number:	BR103.				
3.	Credit hours:	C.H.				TOTAL CR. Hrs.
		Th.	Seminar	Pr	Tu.	
		2	-	-	2	3
4.	Study level/ semester at which this course is offered:	Second Year - First Semester.				
5.	Pre –requisite (if any):	Mathematics (1) (FR001), Mathematics (2) (FR002)				
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 Language.				
9.	Location of teaching the course:	Biomedical Engineering Department.				
10.	Prepared By:	Asst. Prof. Dr. Yasser AL Huri.				
11.	Date of Approval:					

II.Course Description:

This course will introduce the concepts of Ordinary Differential Equations (ODEs) of the first order and some methods to solve it and extended the concept of derivatives and integrals to function of more than one variable. Topics include: Differential Equations (ODEs), Partial

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differentiation, Double integral, Triple integral, Surf integral, vector fields, Line integral and their applications in the science domains specially in the Biomedical Engineering**.**

III.Course Intended learning outcomes (CILOs) of the course		**Referenced PILOs**
a1.	Define the concept of differential equations, basic concepts of ordinary differential equations (ODEs) of the first order their solutions and their applications.	A1
a2.	Characterize the most important and appropriate techniques and rules to find partial derivative and recognize different techniques of integration in 2D and 3D.	A3
b1.	Examine different methods of integration to solve applied problems.	B1
b2.	Investigate the derivatives and integrals in solving 2D and 3D Biomedical problems.	B2
c1.	Apply various techniques to solve multiple integrals, partial equations ODEs.	C2
d1.	Co-operate with team members to share different knowledge.	D1
d2.	Assess to tasks with the support of the different resources.	D3

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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
a1. Define the concept of differential equations, basic concepts of ordinary differential equations (ODEs) of the first order their solutions and their applications.	• Active Lectures. • Tutorials.	• Written Assessment.
a2. Characterize the most important and appropriate techniques and rules to find partial derivative and recognize different techniques of integration in 2D and 3D.	• Active Lectures. • Tutorials.	• Written Assessment.

(B) Alignment Course Intended Learning Outcomes of Intellectual Skills to Teaching Strategies and Assessment Strategies:		
Course Intended Learning Outcomes	Teaching Strategies	Assessment Strategies
b1. Examine different methods of differentiation and integration to solve applied problems.	• Active Lectures. • Tutorials.	• Written Assessment.
b2. Investigate the derivatives and integrals in solving 2D and 3D Biomedical problems.	• Active Lectures. • Tutorials.	• Written Assessment.

(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. Apply various techniques to solve multiple integrals, partial equations ODEs.	• Active Lectures. • Tutorials.	• Written Assessment.

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(D) Alignment Course Intended Learning Outcomes of Transferable Skills to Teaching Strategies and Assessment Strategies:		
Course Intended Learning Outcomes	Teaching Strategies	Assessment Strategies
d1. Co-operate with team members to share different knowledge.	• Active Lectures. • Tutorials.	• Written Assessment.
d2. Assess to tasks with the support of the different resources.	• Active Lectures. • Tutorials.	• Written Assessment.

IV.Course Content:

A – Theoretical Aspect:

Order	Units/Topics List	Learning Outcomes	Sub Topics List	Number of Weeks	Contact Hours
1.	Differential Equations.	a1,b1,c1,d1, d2.	-Basic concepts. -Homogeneous equations. - First order ordinary differential equations (ODEs) - Linear ODEs. - Nonlinear ODEs. - Separable equations. - Modeling with first order equations. - Autonomous equations. - Exact equations. -Strategy for solving first order ODEs.. - Applications of first order ODEs. - Trajectories, flow of electricity, Newton's law of cooling, Miscellaneous applications.	3	6
2.	Partial Derivatives.	a2, b3,c1,d1.	- Functions of several variables. - Graph, limits, continuity. - Partial derivatives. - Tangent planes, Linear approximations - Chain rule. -Directional derivatives, gradients.	3	6

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			- Max, min values.		
3.	Mid-Term Exam	a1, a2, b1, b2, c1.	The First 2 Chapters.	1	2
4.	Multiple Integrals.	c1,d1, d2.	-Double integrals over rectangles. - Iterated integrals. - Double integrals over general regions. - Double integrals over polar coordinates. - Applications of double integrals.	3	6
5.	Triple Integrals and Change of Variables.	c1,d1,d2.	-Triple integrals. - Triple Integrals in cylindrical Coordinates. - Triple integrals in spherical coordinate. - Change of variables in multiple Integrals.	3	6
6.	Vector Calculus.	c1,d1, d2.	- Vector fields. - Line integrals. - The fundamental theorem for line integrals.	2	4
7.	Final Exam.	a1, a2, 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.	Tutorial_1+2+3 Differential Equations	3	6	a1,a2, b1, b2, d1,d2.
2.	Tutorial_4+5+6 Partial Derivatives	3	6	a2, c1,d1, d2.
3.	Tutorial_7+8+9	3	6	c1,d1, d2.

Head of Department
Dr. Mohammed A. Al-Olofi

Quality Assurance Unit
Ass. Prof. Dr. Mohammad Algorafi

Dean of the Faculty
Prof. Dr. Mohammed AL-Bukhaiti

Academic Development Center & Quality Assurance
Ass. Prof. Dr. Huda Al-Emad

Rector of Sana'a University
Prof. Dr. Al-Qassim Mohammed Abbas

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	Multiple Integrals			
4.	Tutorial_10+11+12 Triple Integrals	3	6	c1,d1, d2.
5.	Tutorial_13+14 Vector Calculus	2	4	b1,c1,d1, d2.
Number of Weeks /and Units Per Semester		**14**	**28**	

V.Teaching strategies of the course:

- Active Lectures.
- Tutorials.
- Independent Learning.
- Directed Self Study.
- Group Learning and Problem Based Learning.

VI.Assignments:

No	Assignments	Aligned CILOs(symbols)	Week Due	Mark
1.	All the Chapters	a1, a2, b1, b2, c1, d1, d2.	Every week.	15
Total				**15**

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 (Work Sample such as Portfolios).	1-14	15	10 %	a1, a2, b1, b2, c1, d1, d2.
2.	Mid-Term Exam.	7	30	20 %	a1, a2, b1, b2, c1.
3.	Final Exam.	16	105	70 %	a1, a2, b1, b2, c1.
Total			**150**	**100%**	

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VIII.Learning Resources:

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

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

1- Thomas and Finney, 1984, Calculus & Analytic Geometry, Addison Wesleg.
2- Fulks W, 1978, Advanced Calculus, John - Wiley.

2- Essential References.

1- Fleming W, 1977, Functions of Several Variables, Springer Verlag .
2- Stewart J, 1995, Calculus with Analytic Geometry, Cole Publishing Comp.
3- Anton H, 1980, Calculus with Analytic Geometry, John Wiley.

3- Electronic Materials and Web Sites *etc*.

http://ocw.mit.edu/courses/
http://www.maths.manchester.ac.uk/
http://wumath.wustl.edu

IX.Course Policies:

1.	**Class Attendance:** - The students should have more than 75% of attendance according to rules and regulations of the faculty.
2.	**Tardy:** - The students should respect the timing of attending the lectures. They should attend within 15 minutes from starting of the lecture.
3.	**Exam Attendance/Punctuality:** - The student should attend the exam on time. The punctuality should be implemented according to rules and regulations of the faculty for mid-term exam and final exam.
4.	**Assignments & Projects:** - The assignment is given to the students after each chapter; the student has to submit all the assignments for checking on time.
5.	**Cheating:** - If any cheating occurred during the examination, the student is not allowed to continue and he has to face the examination committee for enquires.

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6.	**Plagiarism:** - If one student attends the exam on another behalf; he will be dismissed from the faculty according to the policy, rules and regulations of the university.
7.	**Other Policies:** - All the teaching materials should be kept out the examination hall and mobile phones are not allowed. - Mutual respect should be maintained between the student and his teacher and also among students. Failing in keeping this respect is subject to the policy, rules and regulations of the university.

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

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Template for Course Plan of Mathematics (3)

I.Information about Faculty Member Responsible for the Course:							
Name of Faculty Member	Asst. Prof. Dr. Yaser Al-Huri.	**Office Hours**					
Location& Telephone No.	Department of Basic Engineering Sciences. 00967773038653.	**SAT**	**SUN**	**MON**	**TUE**	**WED**	**THU**
E-mail	yasseralhuri@yahoo.com.						

II.Course Identification and General Information:						
1.	Course Title:	Mathematics (3).				
2.	Course Number & Code:	BR103.				
3.	Credit hours:	**C.H**				**Total Credit Hours**
		Th.	**Seminar**	**Pr.**	**Tu.**	
		2	-	-	2	3
4.	Study level/year at which this course is offered:	Second Level - First Semester.				
5.	Pre –requisite (if any):	Mathematics 1 (FR001), Mathematics 2 (FR002)				
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 Language.				
9.	System of Study:	Semesters.				
10.	Mode of delivery:	Lecture and Tutorials.				
11.	Location of teaching the course:	Biomedical Engineering Department.				

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III.Course Description:

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IV.Course Intended learning outcomes (CILOs) of the course		Referenced PILOs
a1.	Define the concept of differential equations, basic concepts of ordinary differential equations (ODEs) of the first order their solutions and their applications.	A1
a2.	Characterize the most important and appropriate techniques and rules to find partial derivative and recognize different techniques of integration in 2D and 3D.	A3
b1.	Examine different methods of integration to solve applied problems.	B1
b2.	Investigate the derivatives and integrals in solving 2D and 3D Biomedical problems.	B2
c1.	Apply various techniques to solve multiple integrals, partial equations ODEs.	C2
d1.	Co-operate with team members to share different knowledge.	D1
d2.	Assess to tasks with the support of the different resources.	D3

V.Course Content:

A – Theoretical Aspect:

Order	Units/Topics List	Sub Topics List	Number of Weeks	Contact Hours
1.	Differential	-Basic concepts.	1,2,3	6

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	Equations.	-Homogeneous equations. - First order ordinary differential equations (ODEs) - Linear ODEs. - Nonlinear ODEs. - Separable equations. - Modeling with first order equations. - Autonomous equations. - Exact equations. -Strategy for solving first order ODEs.. -Applications of first order ODEs. -Trajectories, flow of electricity, Newton's law of cooling, Miscellaneous applications.		
2.	Partial Derivatives.	- Functions of several variables. - Graph, limits, continuity. - Partial derivatives. - Tangent planes, Linear approximations - Chain rule. - Directional derivatives, gradients. - Max, min values.	4,5,6	6
3.	Mid-Term Exam.	The first 2 chapters	7	2
4.	Multiple Integrals.	-Double integrals over rectangles. - Iterated integrals. - Double integrals over general regions. - Double integrals over polar coordinates. - Applications of double integrals.	8,9,10	6
5.	Triple Integrals and Change of Variables.	-Triple integrals. - Triple Integrals in cylindrical Coordinates. - Triple integrals in spherical coordinate. - Change of variables in multiple Integrals.	11,12,13	6

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6.	Vector Calculus.	- Vector fields. - Line integrals. - The fundamental theorem for line integrals.	14,15	4
7.	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.	Tutorial_1+2+3 Differential Equations	3	6	a1,a2, b1, b2, d1,d2.
2.	Tutorial_4+5+6 Partial Derivatives	3	6	a2, c1,d1, d2.
3.	Tutorial_7+8+9 Multiple Integrals	3	6	c1,d1, d2.
4.	Tutorial_10+11+12 Triple Integrals	3	6	c1,d1, d2.
5.	Tutorial_13+14 Vector Calculus	2	4	b1,c1,d1, d2.
Number of Weeks /and Units Per Semester: 14			**28**	

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VI.Teaching strategies of the course:

- Active Lectures.
- Tutorials.
- The use of Computer and Web-Based Learning..
- Independent Learning.
- Directed Self Study.
- Group Learning and Problem Based Learning.

VII.Assignments:

No	Assignments	Aligned CILOs(symbols)	Week Due	Mark
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Total				**15**

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2.	Mid-Term Exam.	7	30	20 %	a1, a2, b1, b2, c1.
3.	Final Exam.	16	105	70 %	a1, a2, b1, b2, c1.
Total			**150**	**100%**	

IX.Learning Resources:

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	1- Fleming W, 1977, Functions of Several Variables, Springer Verlag . 2- Stewart J, 1995, Calculus with Analytic Geometry, Cole Publishing Comp. 3- Anton H, 1980, Calculus with Analytic Geometry, John Wiley.
3- Electronic Materials and Web Sites *etc*.	
	http://ocw.mit.edu/courses/ http://www.maths.manchester.ac.uk/ http://wumath.wustl.edu

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X.Course Policies:	
Unless otherwise stated, the normal course administration policies and rules of the Faculty of Engineering apply. For the policy, see: ----------	
1.	**Class Attendance:** - The students should have more than 75% of attendance according to rules and regulations of the faculty.
2.	**Tardy:** - The students should respect the timing of attending the lectures. They should attend within 15 minutes from starting of the lecture.
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