



17 Course Specification of Mathematics 3

I. Course Identification and General Information:					
1.	Course Title:	<i>Mathematics 3</i>			
2.	Course Code & Number:	BR103			
3.	Credit hours:	C.H.			Credit Hours
		Th.	Tu	Pr	Tr.
		2	2	-	
4.	Study level/ semester 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:	Mechatronics, Mechanical ,Civil, Electric Engineering Departments.			
8.	Language of teaching the course:	English Language.			
9.	Location of teaching the course:	Faculty of Engineering, Sana'a University.			
10.	Prepared By:	Associate Prof. Dr. Yasser ALhuri.			
11.	Date of Approval:	December 2019.			

II. Course Description:

This course **introduces** the concepts of Ordinary Differential Equations (ODEs) of the first order and some methods to solve it and **extends** the **concepts** of derivatives and integrals to function of more than one variable. **Topics include** Differential Equations (ODEs), Partial differentiation, Double integral, Triple integral, Surf integral, vector fields, Line **integral and** their applications in the science domains specially in the Civil Engineering.

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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.	Identify the most important and appropriate techniques and rules to find Partial derivative and recognize different techniques of integration in 2D and 3D.	A3
a3.	Establish double and triple integrals to compute area, volume, Mass, moments of inertia and surface area.	A1
b1.	Examine different methods of integration to solve applied problems.	B1
b2.	Investigate the derivatives and integrals in solving 2D and 3D civil engineering problems.	B2
c1.	Apply various techniques to solve Multiple Integrals, partial equations ODEs.	C3
d1.	Co-operate with team members to share different knowledges.	D3
d2.	Assess to tasks with the support of the different resources.	D5

(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.	<ul style="list-style-type: none"> Active Lectures. Tutorials. 	<ul style="list-style-type: none"> Written Assessment. Final exam
a2. Identify the most important and appropriate techniques and rules to find Partial derivative and recognize different techniques of integration in 2D and 3D.	<ul style="list-style-type: none"> Active Lectures. Tutorials. 	<ul style="list-style-type: none"> Written Assessment. Final exam
a3. Establish double and triple integrals to compute area, volume, Mass, moments of inertia and surface area.	<ul style="list-style-type: none"> Active Lectures. Tutorials. 	<ul style="list-style-type: none"> Written Assessment. Final exam

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(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.	<ul style="list-style-type: none"> • Active Lectures. • Tutorials. 	<ul style="list-style-type: none"> • Written Assessment. • Final exam
b2. Investigate the derivatives and integrals in solving 2D and 3D Civil problems.	<ul style="list-style-type: none"> • Active Lectures. • Tutorials. 	<ul style="list-style-type: none"> • Written Assessment. • Final exam

(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 compute partial derivatives, solve ODEs, Multiple Integrals, Vector Calculus.	<ul style="list-style-type: none"> • Active Lectures. • Tutorials. 	<ul style="list-style-type: none"> • Written Assessment. • 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
d1. Co-operate with team members to share different knowledges.	<ul style="list-style-type: none"> • Case Studies. 	<ul style="list-style-type: none"> • Written Assessment.
d2. Assess to tasks with the support of the different resources.	<ul style="list-style-type: none"> • Case Studies. 	<ul style="list-style-type: none"> • Written Assessment.

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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.	Differential Equations	a1,b1,c1, d1,d2	<ul style="list-style-type: none"> -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,b2,c1, d1	<ul style="list-style-type: none"> - Functions of Several Variables. - Graph, Limits, Continuity. - Partial Derivatives. - Tangent Planes, Linear Approximations - Chain Rule. - Directional Derivatives, Gradients. - Max, Min Values. 	3	6
3.	Multiple Integrals	a2,a3,b1, b2,c1,d2	<ul style="list-style-type: none"> -Double Integrals over Rectangles. - Iterated Integrals. - Double Integrals over General Regions. - Double Integrals over Polar Coordinates. - Applications of Double Integrals. 	1	2

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4.	Multiple Integrals	a2,a3,b1, b2,c1,d2	-Double Integrals over Rectangles. - Iterated Integrals. - Double Integrals over General Regions. - Double Integrals over Polar Coordinates. - Applications of Double Integrals.	2	4
5.	Triple Integrals and Change of Variables	a2,a3, b1,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	b2,c1,d1	- Vector Fields. - Line Integrals. - The Fundamental Theorem for Line Integrals.	2	4
Number of Weeks /and Units Per Semester				14	28

B – Tutorial Aspect:				
Order	Tasks/ Experiments	Number of Weeks	Contact hours	Learning Outcomes
1.	Tutorial_1+2+3 Differential Equations	3	6	a1,b1,c1,d1,d2.
2.	Tutorial_4+5+6 Partial Derivatives	3	6	a2,b2,c1,d1.
3.	Tutorial_7+8+9 Multiple Integrals	3	6	a2,a3,b1,b2,c1,d2.
4.	Tutorial_10+11+12 Triple Integrals	3	6	a2,a3, b1,c1,d1,d2.
5.	Tutorial_13+14 Vector Calculus	2	4	b2,c1,d1.
Number of Weeks /and Units Per Semester		14	28	

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V. Teaching strategies of the course:

- Active Lectures.
- Tutorials.
- Case Studies.

VI. Assignments:

No	Assignments	Aligned CILOs(symbols)	Week Due	Mark
1.	Differential Equations (Tutorial 1+2+3)	a1,b1,c1,d1,d2.	First, Second and Third Weeks.	9
2.	Partial Derivatives (Tutorial 4+5+6)	a2,b2,c1,d1.	Fourth, Fifth and Sixth Weeks.	9
3.	Multiple Integrals (Tutorial 7+8+9)	a2,a3,b1,b2,c1,d2.	Seventh, Eight and Ninth Weeks.	9
4.	Triple Integrals (Tutorial 10+11+12)	a2,a3, b1,c1,d1,d2.	Tenth, Eleventh and Twelfth Weeks.	9
5.	Vector Calculus (Tutorial 13+14)	b2,c1,d1.	Thirteenth and Fourteen Weeks.	9

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	45	30 %	all
2.	Final Exam.	15	105	70 %	all
	Total	16	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 Wesley.
- 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.*

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I. 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 10 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 enquiries .
6.	Plagiarism: The student will be terminated from the Faculty, if one student attend the exam on another behalf according to the policy, rules and regulations of the university.
7.	Other policies: <ul style="list-style-type: none"> • All the teaching materials should be kept out the examination hall. • The mobile phone is not allowed. • There should be a respect between the student and his teacher.

Reviewed By	<u>Vice Dean for Academic Affairs and Post Graduate Studies</u> <u>Dr. Tarek A. Barakat</u> <u>Dr. Riyad A. Muharam</u> <u>Dr. Abdul-Malik Momin</u> <u>Dr. Mohammad Algorafi</u>
	<u>Deputy Rector for Academic Affairs Dr. Ibrahim AlMutaa</u> <u>Dr. Ahmed mujahed</u> <u>Dr. Munaser Alsubri</u>

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Template for Course Plan (Syllabus)- Mathematics 3

I. Information about Faculty Member Responsible for the Course:						
Name of Faculty Member	Dr. Yasser Alhuri	Office Hours				
Location & Telephone No.	Department of Basic Engineering Science 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			
		Th.	Tu	Pr	Tr.
		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	Mechatronics, Mechanical ,Civil, Electric Engineering Departments.			
8-	Language of teaching the course:	English Language.			
9-	System of Study:	Classes			
10-	Mode of delivery:	Lecture			
11-	Location of teaching the course:	Faculty of Engineering			

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III. Course Description:

This course **introduces** the concepts of Ordinary Differential Equations (ODEs) of the first order and some methods to solve it and extends the concepts of derivatives and integrals to function of more than one variable. **Topics include** Differential Equations (ODEs), Partial differentiation, Double integral, Triple integral, Surf integral, vector fields, Line **integral and** their applications in the science domains specially in the Civil Engineering.

IV. Intended learning outcomes (ILOs) of the course:

- Brief summary of the knowledge or skill the course is intended to develop:

- a.1** Define the concept of Differential Equations, basic concepts of Ordinary Differential Equations (ODEs) of the first order their solutions and their applications. A1
- a.2** Identify the most important and appropriate techniques and rules to find Partial derivative and recognize different techniques of integration in 2D and 3D. A3
- a.3** Establish double and triple integrals to compute area, volume, Mass, moments of inertia and surface area. A1
- b.1** Examine different methods of integration to solve applied problems. B1
- b.2** Investigate the derivatives and integrals in solving 2D and 3D civil engineering problems. B2
- c.1** Apply various techniques to solve Multiple Integrals, partial equations ODEs. C3
- d.1** Co-operate with team members to share different knowledges. D3
- d.2** Assess to tasks with the support of the different resources. D5

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V. Course Content:				
<ul style="list-style-type: none"> Distribution of Semester Weekly Plan of Course Topics/Items and Activities. 				
A – Theoretical Aspect:				
Order	Topics List	Sub Topics List	Week Due	Contact Hours
1.	Differential Equations	<ul style="list-style-type: none"> -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. 	1,2,3	6
2.	Partial Derivatives	<ul style="list-style-type: none"> - 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.	Multiple Integrals	<ul style="list-style-type: none"> -Double Integrals over Rectangles. - Iterated Integrals. - Double Integrals over General Regions. - Double Integrals over Polar Coordinates. 	7	2

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		- Applications of Double Integrals.		
4.	Midterm Exam		8	2
5.	Multiple Integrals	-Double Integrals over Rectangles. - Iterated Integrals. - Double Integrals over General Regions. - Double Integrals over Polar Coordinates. - Applications of Double Integrals.	9,10	4
6.	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
7.	Vector Calculus	- Vector Fields. - Line Integrals. - The Fundamental Theorem for Line Integrals.	14,15	4
8.	Final Exam		16	2
Number of Weeks /and Units Per Semester			16	32

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B – Tutorial Aspect:

Order	Tasks/ Experiments	Number of Weeks	Contact Hours
1.	Differential Equations (Tutorial 1+2+3)	1,2,3	6
2.	Partial Derivatives (Tutorial 4+5+6)	4,5,6	6
3.	Multiple Integrals (Tutorial 7+8+9)	7,8,9	6
4.	Triple Integrals (Tutorial 10+11+12)	10,11,12	6
5.	Vector Calculus (Tutorial 13+14)	13,14	4
Number of Weeks /and Units Per Semester		14	28

VI. Teaching strategies of the course:

- Active Lectures.
- Tutorials.
- Case Studies.

VII. Assignments:

No	Assignments	Aligned CILOs(symbols)	Week Due	Mark
1.	Differential Equations (Tutorial 1+2+3)	a1,b1,c1,d1,d2.	First, Second and Third Weeks.	9
2.	Partial Derivatives (Tutorial 4+5+6)	a2,b2,c1,d1.	Fourth, Fifth and Sixth Weeks.	9
3.	Multiple Integrals (Tutorial 7+8+9)	a2,a3,b1,b2,c1,d2.	Seventh, Eight and Ninth Weeks.	9
4.	Triple Integrals (Tutorial 10+11+12)	a2,a3, b1,c1,d1,d2.	Tenth, Eleventh and Twelfth Weeks.	9
5.	Vector Calculus (Tutorial 13+14)	b2,c1,d1.	Thirteenth and Fourteen Weeks.	9

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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 (Work Sample such as Portfolios).	1-14	45	30 %	all
2.	Final Exam.	15	105	70 %	all
	Total	16	150	100%	

IX. Learning Resources:

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

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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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