Sana'a University
Faculty of Engineering
Mechanical Engineering Department
Mechanical Engineering Program

13. Course Plan of Mathematics 2

I. Information about Faculty Member Responsible for the Course:

Name of Faculty Member	Asst. Prof. Dr. Adnan Alsalihi	Office Hours					
		SAT	SUN	MON	TUE	WED	THU
Location& Telephone No.	Sana'a university 770499879						
E-mail	Adnans2000@gmail.com						

II. Course Identification and General Information:

1.	Course Title:	Mathematics 2			
2.	Course Number & Code:	FR003			
3.	Credit Hours:	C.H				TOTAL CR. HRS
		Th.	Seminar/Tu.	Pr.	Tr.	
		2	2	-	-	3
4.	Study level/year at which this course is offered:	Second Year – First Semester.			
5.	Pre –requisite (if any):	Mathematics 1 (FR001).			
6.	Co –requisite (if any):	None			
7.	Program (s) in which the course is offered	Mechanical 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:	Mechanical Engineering Department.			

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III.   Course Description:

This course will introduce students to the topics of integral calculus. The course describes the most important ideas, fundamental concepts, theorems, and examples of integration, plane and space vectors, infinite sequences and series, Taylor and Maclaurin series, and parametric equations. The theoretical concepts will be supported by practical engineering examples and applications.

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

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

1. Recognize the concepts and theories of integral calculus, vectors and series, appropriate to the engineering applications.
2. Identify the most important and appropriate techniques of integrations and used the applicable methods in studying physics and various disciplines of engineering.
3. Illustrate the relation between differential and integral calculus.
4. Construct mathematical models of problems related to science and Mechanical engineering and then solve and analyze the model.
5. Test improper integrals and infinite sequences and series for convergence.
6. Calculate the volume of solids, lengths of smooth curves, area of a surface of revolution, work done by a variable force, etc. by means a definite integral.
7. Compute graph parametric equations and determine curve orientations.
8. Apply the definite integral to determine solutions to problems in science and engineering including center of mass of a lamina, length of curve and the area of surface revolution, force, fluid pressure vectors.
9. Assess to manage tasks, time, and resources.
10. Cooperate effectively in-group and individually.

V. Course Content:

A – Theoretical Aspect:

Order	Units/Topics List	Sub Topics List	Week Due	Contact hours
1	Anti-derivatives and Sigma Notation.	Definition and Notation. Rules for Anti-derivatives. Sigma Notation Area and Riemann Sums and Definite Integrals.	1st	2

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		Properties of the Definite Integral.		
2	The Fundamental Theorem of Calculus	Definition and Notation. Rules for Anti-derivatives. Sigma Notation Area and Riemann Sums and Definite Integrals. Properties of the Definite Integral.	2nd	2
3	Basic rule of integration	Definition and Notation. Rules for Anti-derivatives. Sigma Notation Area and Riemann Sums and Definite Integrals. Properties of the Definite Integral.	3rd	2
4	Integration of elementary functions.	Integration of the Natural Logarithmic Functions. Integration of Trigonometric Functions. Integration of Inverse Trigonometric Functions. Integration Hyperbolic Functions. Integration of Inverse Hyperbolic Functions	4th and 5th	4
5	Applications of Integration	Area of a Region Between Two Curves Volume: The Disk Method Volume: The Shell Method Arc Length and Surfaces of Revolution Applications in Physics and Engineering Differential Equations: Growth and Decay. Moments and center of mass of a Lamina	6th and 7th	4
6	Mid-Term Exam	The First Fifth Chapters	8th	2
7	Vectors	Vectors in the Plane Space Coordinates and Vectors in Space The Dot Product of Two Vectors The Cross Product of Two Vectors in Space	9th	2

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8	Vectors and the Geometry of Space	Plane Curves and Parametric Equations. Lines and Planes in Space Surfaces in Space Cylindrical and Spherical Coordinates	10th	2
9	Techniques of integrations	Integration by Part Integration by successive. Integration by Substitution. Integrals by Partial Fractions. Integration by Tables and Other Integration Techniques	11th & 12th	4
10	Improper Integrals	Indeterminate Forms and L'Hôpital's Rule. Improper Integrals Properties of improper integrals.	13th	2
11	Sequences And Series	Sequences Series and Convergence The Integral and Comparison Tests Other Convergence Tests.	14th	2
12	Power Series	Taylor Polynomials and Approximations Power Series Representation of Functions by Power Series Taylor and Maclaurin Series	15th	2
13	Final Exam	All Chapters	16th	2
Number of Weeks /and Units Per Semester			**16**	**32**

B - Tutorial Aspect:			
Order	**Topics List**	**Week Due**	**Contact Hours**
1	Anti-derivatives and the definite integral: Tutorial 1	1st	2
2	The Fundamental Theorem of Calculus: Tutorial 2	2nd	2
3	Basic rule of integration: Tutorial 3	3rd	2
4	Integration of elementary functions: Tutorial 4 & 5	4th & 5th	4

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5	Applications of Integration: Tutorial 6&7	6th & 7th	4
6	Vectors and the Geometry of Space: Tutorial 8 &9	8th & 9th	4
7	Techniques of integrations: Tutorial 10 & 11	10th &11th	4
8	Improper Integrals: Tutorial 12	12th	2
9	Sequences and Series: Tutorial 13	13th	2
10	Power Series: Tutorial 14	14th	2
Number of Weeks /and Units Per Semester		**14**	**28**

VI. Teaching strategies of the course:

Lectures.

Tutorials.

Exercises and Homework.

Interactive Class Discussions

Team work (group learning)

VII. Assignments:

No	Assignments	Aligned CILOs(symbols)	Week Due	Mark
1	Assignments on anti-derivatives, Sigma Notation and basic rule of integration.	a1, a2, a3, b1, c1, c3	2nd, 3rd and 4th	3
2	Individual written assignments or in groups on Applications of Integration	a1, a2, b1, b3, c1, c3	6th And 7th	3
3	Assignments on Techniques of integrations	a1, a2, b1, c1, c3	8th And 9th	3
4	Assignments on Improper Integrals and Sequences and Series	a1, a2, b1, c1, c2	12th and 13th	4
Total				**15**

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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	Oral presentations and Quizzes	4th ,6th &12th	15	10 %	a1, a2,a3,b1,b2, c1,c3
2	Individual written assignments or in groups	3rd ,5th 9th,11th,13th	15	10 %	a1, a2 ,b1, c1,c3
3	Mid-term Exam	8th	30	20 %	a1, a2,a3, b1 c1, c3, d1
4	Final Exam	16th	90	60 %	a1, a2,b1, b2, c1,c2,c2
	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).

1. Larson, R., & Hodgkins, A. V. 2012, College Algebra and Calculus: An Applied Approach. Nelson Education.
2. Tomas, 2010, Calculus 12th Edition, Addison-Wesley Pearson.

2- Essential References.

1. John Bird, 2007, Engineering Mathematics. Published by Elsevier Ltd. Fifth Edition
2. Howard Anton, 1995, Calculus Fifth Edition, John Wiley & Sons, Inc. New York Chi Chester   Brisbane Toronto Singapore.
3. Larson, R., Hostetler, R. P., & Edwards, B.H., 2007, Essential Calculus: Early Transcendental Functions. Cengage Learning.
4. Larson, R. 2012, Pre-Calculus with Limits. Cengage Learning.

3- Electronic Materials and Web Sites *etc*.

1. https://www.khanacademy.org/
2. www.math.com/
3. https://ocw.mit.edu/courses/mathematics/
4. https://uwaterloo.ca/mathematics-online-learning/

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X.	Course Policies:
1.	**Class Attendance:** **-**A student should attend not less than 75 % of total hours of the subject; otherwise he 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 an approved statement from university Clinic
2.	**Tardy:** **-** For late in attending the class, the student will be initially notified. If he repeated lateness in attending class he will be considered as absent.
3.	**Exam Attendance/Punctuality:** **-** A student should attend the exam on time. He 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:** **-** The assignment is given to the students after each chapter; the student has to submit all the assignments for checking on time.
5.	**Cheating**: **-** For cheating in exam, a student will be considered as failure. 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 proved a plagiarism of a student, he 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.
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 my given directly to students using soft or hard copy

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