Module (Course Syllabus) Catalogue

2022-2023

College/ Institute	**Erbil Technical Engineering College**	
Department	**Civil Engineering**	
Module Name	**Mathematics I**	
Module Code	**MAT204**	
Degree	**Technical Diploma** [ ] **Bachelo** [*] **High Diploma** [ ] **Master** [ ] **PhD** [ ]	
Semester	**2**	
Qualification	**B.Sc**	
Scientific Title	**Engineer**	
ECTS (Credits)	**7**	
Module type	**Prerequisite** [ ] **Core** [*] **Assist.** [ ]	
Weekly hours	**4 Hrs**	
Weekly hours (Theory)	**(4)hr Class**	**(189)Total hrs Workload**
Weekly hours (Practical)	**(N/A)hr Class**	**(N/A)Total hrs Workload**
Number of Weeks	**14**	
Lecturer (Theory)	**Diyar Ismail Hassan**	
E-Mail & Mobile NO.	**Diyar.hassan@epu.edu.iq**	
Lecturer (Practical)	**N/A**	
E-Mail & Mobile NO.	**N/A**	
Websites		

Course Book

Course Description	In this course students will extend their experience with functions, limits and intervals, as they study the fundamental concepts of the way of solving equations by matrices. Important objectives of this course are to develop and strengthen the student's ability to solve derivatives in different types of functions. This course is designed to make the student understand number categories, functions, graph of functions, domains, ranges, limits, continuity, derivatives, integrations, natural logarithms, exponential functions, logarithmic functions, inverse trigonometric functions, hyperbolic functions, inverse hyperbolic functions, integration by part, integration using partial fractions, trapezoidal method.
Course objectives	A primary objective of a course in mathematics is to provide a bridge for the student from high-school or lower-division mathematics courses to upper division mathematics. The student will be challenged to grow in mathematical maturity, and to develop and strengthen problem-solving skills.
Student's obligation	The students should be available during lecture time table when the student absence more than the allowed hours the student will be dismissed. Students should be doing quizzes, seasonal tests and final exams in order to able to collect required mark to success.
Required Learning Materials	Notebook, Textbook is optional

Evaluation

Task		Weight (Marks)	Due Week	Relevant Learning Outcome
Paper Review				
Assignments	Homework	**10%**	**3,6, 8,11**	**1,2,3**
	Class Activity	**2%**	**All**	**1,2,3**
	Report	**8%**	**9**	**1,2,3,4**
	Seminar	**8%**	**10**	**1,2,3,4**
	Essay	**NA**		
	Project	**NA**		
Quiz		**8%**	**3,6,8,11**	**1,2**
Lab.		**NA**		
Midterm Exam		**24%**	**6**	**1,2**
Final Exam		**40%**		**1,2**
Total		**100%**		

Specific learning outcome:	1- Utilizing different types of functions 2- Employing integration methods to find areas and volume 3- Using Derivatives and their applications 4- Employing integration methods 5- Using Transcendental Function as an alternative to other functions. 6- How to deal with Limits
Course References:	- Calculus, Thomas, edition 11. - Douglas N. Clark, Dictionary of Analysis Calculus and Differential Equations. Boca Raton, FL: CRC Press, 2000. - McGraw-Hill Dictionary of Mathematics: 2nd edition New York, 2003. - Oxford Users' Guide to Mathematics, Oxford, UK: Oxford University Press, 2004.

Course topics (Theory)	Week	Learning Outcome
1. Functions.	1	1,6
2. Range & Domains.	2	1,3
3. Derivation.	**3**	**3,5**
4. Curve Tracing	**4**	**1,2**
5. Limits.	**5**	**1,6**
6. Area & Volume Integration.	**6**	**2,4**
7. Fundamental theorem of Integration.	**7**	**2,4**
8. Application of Integration.	**8**	**2,4**
9. Area, Volume, Length of curves.	**9**	**2,4**
10. Area of Surface of Revolution.	**10**	**2,4**
11. Transcendental Function & their Inverse.	**11**	**1,5**
12. Transcendental Function & their Derivative.	**12**	**1,5**
13. Conic Sections.	**13**	**1,2,4**
14. Methods of Integration.	**14**	**2,4**

Questions Example Design

Q1/ Find the derivative of square root function $y = \sqrt{x}\ for\ x > 0$ and draw the tangent line to the curve $y = \sqrt{x}\ \ at\ \ x = 4$.

Solution:

We use the equivalent form to calculate f':

$$f'(x) = \lim_{z \to x} \frac{f(z) - f(x)}{z - x}$$

$$= \lim_{z \to x} \frac{\sqrt{z} - \sqrt{x}}{z - x}$$

$$= \lim_{z \to x} \frac{\sqrt{z} - \sqrt{x}}{\left(\sqrt{z} - \sqrt{x}\right)\left(\sqrt{z} + \sqrt{x}\right)}$$

$$= \lim_{z \to x} \frac{1}{\sqrt{z} + \sqrt{x}} = \frac{1}{2\sqrt{x}}.$$

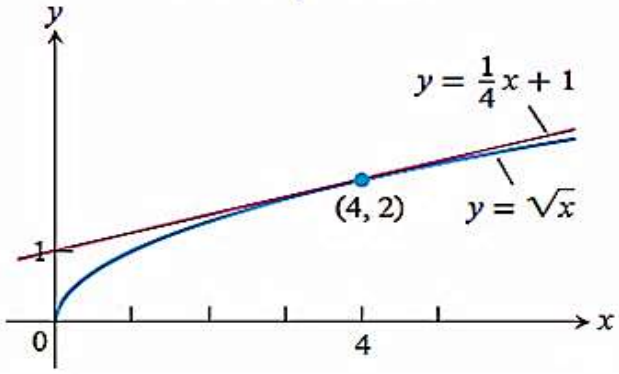
The slope of the curve at $x = 4$ is

$$f'(4) = \frac{1}{2\sqrt{4}} = \frac{1}{4}.$$

The tangent is the line through the point (4, 2) with slope 1/4

$$y = 2 + \frac{1}{4}(x - 4)$$

$$y = \frac{1}{4}x + 1.$$



Q2/ A curved wedge is cut from a cylinder of radius 3 by two planes. One is perpendicular to the axis of the cylinder. The second plane crosses the first plane at a 45 degree angle at the center of the cylinder. Find the volume of the wedge.

Solution:

A curved wedge is cut from a cylinder of radius 3 by two planes. One plane is perpendicular to the axis of the cylinder. The second plane crosses the first plane at a 45° angle at the center of the cylinder. Find the volume of the wedge.

Solution We draw the wedge and sketch a typical cross-section perpendicular to the x-axis (Figure 6.7). The cross-section at x is a rectangle of area

$$A(x) = (\text{height})(\text{width}) = (x)\left(2\sqrt{9 - x^2}\right)$$
$$= 2x\sqrt{9 - x^2}.$$

The rectangles run from $x = 0$ to $x = 3$, so we have

$$V = \int_a^b A(x)\,dx = \int_0^3 2x\sqrt{9 - x^2}\,dx$$
$$= -\frac{2}{3}(9 - x^2)^{3/2}\Big]_0^3$$
$$= 0 + \frac{2}{3}(9)^{3/2}$$
$$= 18.$$

Let $u = 9 - x^2$, $du = -2x\,dx$, integrate, and substitute back.

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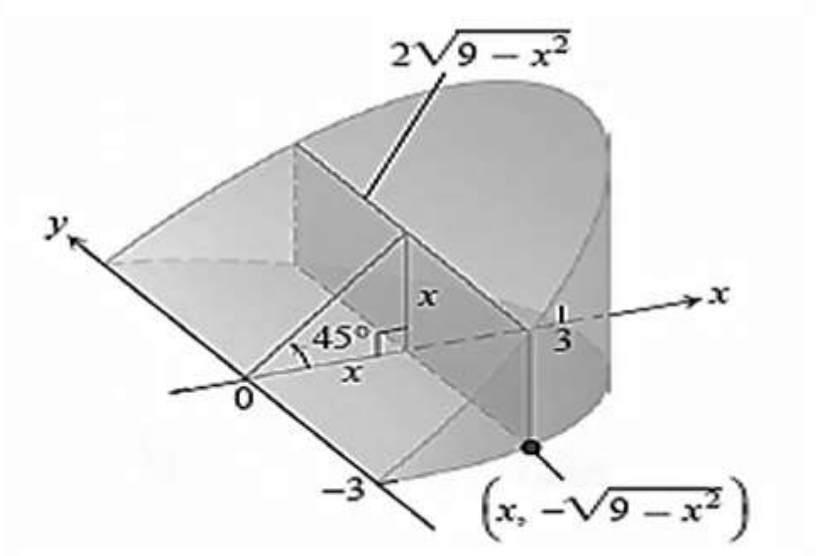

Extra notes:

External Evaluator

As a lecturer I have reviewed the Course Catalogue related to the subject of Mathematic I for second Semester, Department of Civil Engineering, College of Technology, I found that the course Book is very good describing the aim and objectives of the subject. Moreover, it is covering all the required syllabus and contents of the course and describes satisfactorily the aspects related to the course.

Dr. Bahman Omar Taha
Ph.D. in Structural Engineering.