

Module (Course Syllabus) Catalogue

2022-2023

College/ Institute	Erbil Technical Engineering College	
Department	Civil Engineering	
Module Name	Mathematics II	
Module Code	MAT302	
Degree	Technical Diploma <input type="checkbox"/>	Bachelo <input type="checkbox"/> *
	High Diploma <input type="checkbox"/>	Master <input type="checkbox"/> PhD <input type="checkbox"/>
Semester	3	
Qualification	B.Sc	
Scientific Title	Engineer	
ECTS (Credits)	5	
Module type	Prerequisite <input type="checkbox"/>	Core <input type="checkbox"/> * Assist. <input type="checkbox"/>
Weekly hours	3 Hrs	
Weekly hours (Theory)	(3)hr Class	()Total hrs Workload
Weekly hours (Practical)	(N/A)hr Class	(N/A)Total hrs Workload
Number of Weeks	15	
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	The course is a continuation of Mathematics I which was covered in the first year. It will cover several topics including polar and space coordinates, vectors, curvatures, equations of lines and planes, functions, partial derivatives, differentiation, integration, series, and complex numbers. The course only includes theoretical hours, but assignments and unannounced assessments are also included.				
Course objectives	To prepare students for the core engineering courses such as strength of material, engineering mathematics, structural engineering, and design courses				
Student's obligation	The students are required to attend in-person classes and should not be absent more than the allowable limit. Weekly or bi-weekly homework assignments, quizzes and exams.				
Required Learning Materials	Notebook, Textbook is optional				
Evaluation	Task	Weight (Marks)	Due Week	Relevant Learning Outcome	
	Paper Review				
	Assignments	Homework	10%	3,6, 8	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%		1,2
	Lab.		NA		
	Midterm Exam		24%	6	1,2
	Final Exam		40%	12	1,2
	Total		100%		

Specific learning outcome:	1- Utilizing polar coordinate system 2- Employing integration methods to find areas and volume 3- Using Vectors and vector arithmetic 4- Employing partial derivative methods 5- Using series as an alternative to other functions 6- How to deal with complex numbers.	
Course References:	<ul style="list-style-type: none"> - Engineering Mathematics, 5th Edition, John Bird 2007. - Higher Engineering Mathematics, 5th Edition, John Bird 2006. - Thomas's Calculus, 12th Edition George B. Thomas - Thomas's Calculus-Solution Manual, 12th Edition, George B. Thomas 	
Course topics (Theory)	Week	Learning Outcome
Vectors	1	1,3
Space Coordinates and Equations of Lines and Planes.	2	1,2
Function of two or more variables	3	1,2
Partial Derivatives	4	4
Total & Exact Differential	5	4
Multiple Integrals & Their Applications (Area & Volume)	6	2
Infinite and Power Series and Expansion of Functions by Power Series	7	5
Complex Numbers and Variables.	8	6
Polar, Cylindrical & Spherical Coordinates.	9	1,2
Matrices & Their Operations	10	3
Solution of Simultaneous Equations	11	1,3
Numerical Integration & Determinate	12	2
First Order Differential Equation and their Applications	13	2,4
Second Order Differential Equation and their Applications	14	2,4
Higher Order Differential Equation and their Applications and Fourier series.	15	4,5,6

Questions Example Design

Q1/ Find Second-Order Partial Derivatives $\frac{\partial^2 f}{\partial x^2}$, $\frac{\partial^2 f}{\partial y \partial x}$, $\frac{\partial^2 f}{\partial y^2}$ and $\frac{\partial^2 f}{\partial x \partial y}$

If $f(x, y) = x \cos y + ye^x$.

Solution:

$$\frac{\partial f}{\partial x} = \frac{\partial}{\partial x} (x \cos y + ye^x) = \cos y + ye^x$$

$$\frac{\partial f}{\partial y} = \frac{\partial}{\partial y} (x \cos y + ye^x) = -x \sin y + e^x$$

So

$$\frac{\partial^2 f}{\partial x^2} = \frac{\partial}{\partial x} \left(\frac{\partial f}{\partial x} \right) = ye^x$$

$$\frac{\partial^2 f}{\partial y \partial x} = \frac{\partial}{\partial y} \left(\frac{\partial f}{\partial x} \right) = \frac{\partial}{\partial y} (\cos y + ye^x) = -\sin y + e^x$$

$$\frac{\partial^2 f}{\partial y^2} = \frac{\partial}{\partial y} \left(\frac{\partial f}{\partial y} \right) = \frac{\partial}{\partial y} (-x \sin y + e^x) = -x \cos y$$

$$\frac{\partial^2 f}{\partial x \partial y} = \frac{\partial}{\partial x} \left(\frac{\partial f}{\partial y} \right) = \frac{\partial}{\partial x} (-x \sin y + e^x) = -\sin y + e^x .$$

Q2/ If $\mathbf{a} = \langle 4, 0, 3 \rangle$ and $\mathbf{b} = \langle -2, 1, 5 \rangle$.

Find $|\mathbf{a}|$ and the vectors $\mathbf{a} + \mathbf{b}$, $\mathbf{a} - \mathbf{b}$, $3\mathbf{b}$, and $2\mathbf{a} + 5\mathbf{b}$.

Solution:

$$|a| = \sqrt{4^2 + 0^2 + 3^2} = \sqrt{25} = 5$$

$$a + b = \langle 4, 0, 3 \rangle + \langle -2, 1, 5 \rangle$$

$$= \langle 4 - 2, 0 + 1, 3 + 5 \rangle = \langle 2, 1, 8 \rangle$$

$$a - b = \langle 4, 0, 3 \rangle - \langle -2, 1, 5 \rangle$$

$$= \langle 4 - (-2), 0 - 1, 3 - 5 \rangle = \langle 6, -1, -2 \rangle$$

$$3b = 3\langle -2, 1, 5 \rangle = \langle 3(-2), 3(1), 3(5) \rangle = \langle -6, 3, 15 \rangle$$

$$2a + 5b = 2\langle 4, 0, 3 \rangle + 5\langle -2, 1, 5 \rangle$$

$$= \langle 8, 0, 6 \rangle + \langle -10, 5, 25 \rangle = \langle -2, 5, 31 \rangle$$

Extra notes:

External Evaluator

As a lecturer I have reviewed the Course Book related to the subject of Mathematic II for second year, 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.



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