Module (Course Syllabus) Catalogue

2022-2023

College/ Institute	Erbil Technology College	
Department	Department of ICTE	
Module Name	Engineering Mathematics II	
Module Code	ENM202	
Degree	Technical Diploma ☒ Bachelor ☒ High Diploma ☐ Master ☐ PhD ☐	
Semester	Second semester	
Qualification	M.SC	
Scientific Title	Assistant Lecturer	
ECTS (Credits)	5	
Module type	Prerequisite ☐ Core ☒ Assist. ☐	
Weekly hours	4 Hours	
Weekly hours (Theory)	(2) hrs Class	(125 for whole semester)hr Workload
Weekly hours (Practical)		
Number of Weeks	12	
Lecturer (Theory)	Salar A. Raheem	
E-Mail & Mobile NO.	**salar.raheem.@epu.edu.iq**	
Lecturer (Practical)		
E-Mail & Mobile NO.	07508502617	
Websites		

Course Book

<table>
<tr><td>Course Description</td><td>Now a day, most of the equipment used are Mathematics, therefore it’s very important to recognize the main parts of these systems which include :
Main parts solution and Classification of differential equation How to apply the Integration.
Infinite Sequences and Series, Convergence and Divergence, Infinite Series, Use partial fractions to find the sum of each series.
Application of Integration.
Vectors and the Geometry of Space.</td></tr>
<tr><td>Course objectives</td><td>Applying mathematics operation to recognize and classify ordinary differential equations,solve linear first-order ordinary differential equations, solve constant-coefficient linear second-order differential equations and understand the basic functioning of an NPZ model.
Solving Electrical Engineering equations using Laplace Transform.
Develop inequalities to represent real world situations and use them to solve problems.
Solve problems in a range of mathematical applications using the Integration some electrical application circuit using integration</td></tr>
<tr><td>Student's obligation</td><td>Attendance & follow the lectures
Missed classes will not be compensated including the quizzes and the scheduled assignments. The students will lose marks on unattended classes with quizzes unless a legal document or authorized leave is presented which should explain the excuse of the absence. However, the absent student should take the responsibility for making up the missed lecture Submit homework</td></tr>
<tr><td>Required Learning Materials</td><td>By the end of the course, students should be able to:
Solution of linear equation.
Solving Electrical Engineering equation.
How to solve the differential equations.
transform allows equations in the "time domain" to be transformed into an equivalent equation
APPLICATIONS OF DEFINITE INTEGRALS
INFINITE SEQUENCES AND SERIES</td></tr>
<tr><td>Evaluation</td><td>
<table>
<tr><th colspan="2">Task</th><th>Weight (Marks)</th><th>Due Week</th><th>Relevant Learning Outcome</th></tr>
<tr><td colspan="2">Paper Review</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td rowspan="2">Assignments</td><td>Homework</td><td>10%</td><td></td><td></td></tr>
<tr><td>Class Activity</td><td>2%</td><td></td><td></td></tr>
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		Report	8%		
		Seminar	8%		
		Essay			
		Project	-		
	Quiz		8%	All	All
	Midterm Exam		24%		
	Final Exam		40%		
	Total		100%		
Specific learning outcome:	1- Use geometry and the properties of definite integrals to evaluate them. 2- Methods and techniques to solution differential equation 3- Can determine the convergence or divergence of the series. 4- Apply calculus of three-dimensional space. 5- The students able to use the transformation of the in depended variable to $\int$ domain if the in depended variable is t ,				
Course References:	• Calculus , Robert A. Adams • Thomas Calculus, George B. Thomas, Maurice D. Weir, Joel R. Hass • Internet				

Course topic

Course topics (Theory)	Week	Learning Outcome
1- Application of definite integration	1	Students will be able to Calculate a **definite integral and *Volumes***. Calculate the area between a curve and the x-axis over a given interval
2- Classification of differential equation	2	Students will be able to do the following: recognize and classify ordinary differential equations.
3- Methods and techniques differential equation	3	Determines the type of a linear differential equation systems. Uses the operator method to solve linear systems with constant coefficients.
4- Liner equation and Bernoulli Equation	4	Solves Bernoulli equations. Will be able to find solution of higher-order linear differential

5- Exact Differential Equations	5	Will be able to solve first-order ordinary differential equations
6- Infinite sequences and series	6	determine if a given series is a geometric series and determine if a geometric series converges and divergent
7- Using l'Hôpital's Rule	7	
8- Infinite Series	8	Use the concept of the limit at infinity to determine whether a sequence of real.
9- Vectors and the geometry of space	9	Apply dot or cross product to determine angles between vectors, orientation of axes, areas of triangles and parallelograms in space, scalar and vector
10- Laplace transform	10	inverse Laplace Transform and some applications to solve the differential equations and integral equations
11- Hyperbolic function in Laplace transformation	11	
12- Gamma function :	12	

Questions Example Design

19. Examinations:

Q1. Solve the equation $(x-4)y^4dx - x^3(y^2-3)dy = 0$

Solution: ***dividing by*** x^3y^4***, we obtain***

$$\frac{(x-4)dx}{x^3} - \frac{(y^2-3)dy}{y^4} = 0$$

Or $(x^{-2}-4x^{-3})dx - (y^{-2}-3y^{-4})dy = 0$

Integration, we have the –one parameter family of solutions

$$\int (x^{-2}-4x^{-3})dx - \int (y^{-2}-3y^{-4})dy = 0$$

$$\int x^{-2}\,dx - 4\int x^{-3}dx - \int y^{-2}dy - 3\int y^{-4}dy = 0$$

$$\frac{-1}{x} + \frac{2}{x^2} + \frac{1}{y} - \frac{1}{y^3} = c$$

Q2: A right circular cylindrical tank with radius 5 ft. and height 16 ft. that was

initially full of water is being drained at the rate of $0.5\sqrt{x}ft^3$/min Find a formula for the depth and the amount of water in the tank at any time *t*. How long will it take to empty the tank?

Solution :-

$v = r^2\pi h = (5)^2\,\pi x = 25\pi x$

$\frac{dv}{dt} = 25\pi\frac{dx}{dt}$, (Negative because V is decreasing and $\frac{dy}{dt} < 0$)

$$-0.5\sqrt{x} = 25\pi\frac{dx}{dt}, \qquad \frac{dx}{dt} = \frac{-0.5\sqrt{x}}{25\pi}$$

$x(0) = 16$ The water is 16 ft deep when $t = 0$

We solve the differential equation by separating the variables.

$$x^{-\frac{1}{2}}dx = -\frac{1}{50\pi}dt\,,\ \text{(Integrate both sides.)}$$

$$\int x^{-\frac{1}{2}}dx = \int -\frac{1}{50\pi}dt$$

$$2x^{\frac{1}{2}} = -\frac{t}{50\pi} + c$$

The initial condition $x(0) = 16$ determines the value of *C*.

$$2(16)^{\frac{1}{2}} = -\frac{0}{50\pi} + c$$

$$c = 8$$

$$2x^{\frac{1}{2}} = -\frac{t}{50\pi} + 8\}/2$$

$$x^{\frac{1}{2}} = -\frac{t}{100\pi} + 4$$

$$x = (4 - \frac{t}{100\pi})^2$$

$$v = 25\pi x$$

$$v = 25\pi(4 - \frac{t}{100\pi})^2$$

Q3. *Chose the correct answer for the following statements:*

1-The degree of the differential equation $(\frac{d^2y}{dx^2})^4 + (\frac{dy}{dx})^2 + \sin(\frac{dy}{dx}) + 1 = 0$ *is*

(a) **3** **(b) 2** **(c) 1** **(d) not defined**

2-The solution of the differential equation $(e^x + 1)y\,dy = (y + 1)e^x dx$ is :

(a) $e^y = c(e^x + 1)(y + 1)$ (b) $e^y = c(e^x + y + 1)$ (c) $y = (e^x + 1)(y + 1)$ (d) None of these

3- The solution of the differential equation $\frac{dy}{dx} = 1 - x + y - xy$ is:

(a) $e^{1+y} = x - \frac{x^2}{2} + c$ (b) $\log|1+y| = x - \frac{x^2}{2} + c$ (c) $e^y = x - \frac{x^2}{2} + c$ (d) none of these

Solution :

$$\frac{dy}{dx} = 1 - x - y - xy$$

$$\frac{dy}{dx}(1+y) - (x + xy)$$

$$\frac{dy}{dx}(1+y) - x(1+y)$$

$$\frac{dy}{dx} = (1+y)(1-x)$$

$$\frac{dy}{(1+y)} = (1-x)dx$$

$$\int \frac{dy}{(1+y)} - \int (1-x)dx = 0$$

$$\ln(1+y) - (x - \frac{x^2}{2}) + c$$

Extra notes:

I don't have any notes about all topics

External Evaluator

The course book is covered most of the tasks in the Matlab program and joint most topic in commincation and electronic department .