Module (Course Syllabus) Catalogue

2022-2023

College/ Institute	Erbil Technical Engineering	
Department	Mechanical and Energy Engineering	
Module Name	Engineering Analysis	
Module Code	ENA 604	
Degree	Technical Diploma ☐ Bachler ■ High Diploma ☐ Master ☐ PhD ☐	
Semester	Fifth	
Qualification	Ph.D. in Mechanical Engineering	
Scientific Title	Assistant Professor	
ECTS (Credits)	5	
Module type	Prerequisite ☐ Core ■ Assist. ☐	
Weekly hours		
Weekly hours (Theory)	(3)hr Class	(38)Total hrs Workload
Weekly hours (Practical)	(0)hr Class	(0)Total hrs Workload
Number of Weeks	12	
Lecturer (Theory)	Assist. Prof. Dr. Ahmed Mohammed Adham	
E-Mail & Mobile NO.	ahmed.adham@epu.edu.iq; +9647500271523	
Lecturer (Practical)	Assist. Lect. Ms. Reenas Oraha Canoon	
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Course Book

Course Description	Many engineering applications were based on differential equations. First and higher order differential equations will be taught in this course along with some applications. Laplace method will be also introduced to be as an alternative method to solve differential equations.
Course objectives	The objective of this course is to study: (1) the principle of differential equations. (2) Methods of solutions of first, second and higher order differential equations. (3) Introduction to power series, Fourier series and Gamma function. (4) Laplace transforms and it theorems.
Student's obligation	Student's obligation in the heat transfer course is: • Attendance in the all theoretical and experimental lectures. • Two quizzes, four home works and a mini project in the course. • Examination at the mid and end semester.
Required Learning Materials	• Using data show projector, white board and PowerPoint, Testing in department's Laboratory. • Publish all lecture notes in college website.

Evaluation		Task	Weight (Marks)	Due Week	Relevant Learning Outcome
		Paper Review			
	Assignments	Homework	10%		
		Class Activity	2%		
		Report	8%		
		Seminar			
		Essay			
		Mini Project	8%		
	Quiz		8%		
	Lab.				
	Midterm Exam		24%	6	
	Final Exam		40%	12	
	Total		100%		

Specific learning outcome:	The course will give the fundamental knowledge and practical abilities in the following: • Solving first order differential equations. • Second and higher order differential equations. • Power series. • Laplace Transformation.

Course References:	1. Advanced Engineering Mathematics by: Erwin Keryszig 2. Advanced Engineering Mathematics by: Dennis Zill and etal. 3. Advanced Engineering Mathematics by: Alan Jeffery 4. Differential Equations by: George F. Simmons and Steven G. Krantz

Course topics (Theory)	Week	Learning Outcome
Introduction to Differential equations.	1	
Solutions of differential equations	2-3	
Power series	4-6	
Gamma function and its applications	7-8	
Laplace Transformations.	9	
Application of Laplace Transform	10-12	

Questions Example Design

Theoretical:

Theoretical:

Note: <u>Answer all questions. Laplace transform table is allowed.</u>

<u>Q(1)(20Marks)</u>: Solve the initial-value problem (IVP) if y(0) = 2:

$$\frac{dy}{dx} = \frac{xy^2 - \cos x \sin x}{y(1 - x^2)}$$

<u>Q(2)(20Marks)</u>: Solve the initial-value problem (IVP) if $y(0) = -1$ and $y'(0) = 2$:

$$4y'' + 4y' + 17y = 0$$

<u>Q(3)(20Marks)</u>: Solve the following differential equation:

$$4y'' + 36y = \csc 3x$$

<u>Q(4)(20Marks)</u>: Using Laplace transform theorems, find the inverse of the following equation:

$$\frac{2s - 1}{(s - 1)(s^2 + 4s + 3)}$$

Extra notes:

External Evaluator

I hereby confirm that I have reviewed the content of the course book and found it to be sufficient and covers the learning outcomes of this course.

Dr. Banipal Nanno Yaqob
10/9/2022