



## Module (Course Syllabus) Catalogue 2023-2024

College/ Institute	Erbil Technical Engineering	
Department	Mechanical and Energy Engineering	
Module Name	Engineering Analysis	
Module Code	ENA <b>604</b>	
Degree	Technical Diploma <input type="checkbox"/> Bachler <input checked="" type="checkbox"/> High Diploma <input type="checkbox"/> Master <input type="checkbox"/> PhD <input type="checkbox"/>	
Semester	Fifth	
Qualification	Ph.D. in Mechanical Engineering	
Scientific Title	Professor	
ECTS (Credits)	5	
Module type	Prerequisite <input type="checkbox"/> Core <input checked="" type="checkbox"/> Assist. <input type="checkbox"/>	
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)	Prof. Dr. Ahmed Mohammed Adham	
E-Mail & Mobile NO.	<a href="mailto:ahmed.adham@epu.edu.iq">ahmed.adham@epu.edu.iq</a> ; +9647500271523	
Lecturer (Practical)		
E-Mail & Mobile NO.		
Websites	<a href="https://academicstaff.epu.edu.iq/faculty/ahmed.adham">https://academicstaff.epu.edu.iq/faculty/ahmed.adham</a>	

# Course Book

<b>Course Description</b>	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.				
<b>Course objectives</b>	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.				
<b>Student's obligation</b>	Student's obligation in the heat transfer course is: <ul style="list-style-type: none"> <li>• Attendance in the all theoretical and experimental lectures.</li> <li>• Two quizzes, four home works and a mini project in the course.</li> <li>• Examination at the mid and end semester.</li> </ul>				
<b>Required Learning Materials</b>	<ul style="list-style-type: none"> <li>• Using data show projector, white board and PowerPoint, Testing in department's Laboratory.</li> <li>• Publish all lecture notes in college website.</li> </ul>				
<b>Evaluation</b>	<b>Task</b>	<b>Weight (Marks)</b>	<b>Due Week</b>	<b>Relevant Learning Outcome</b>	
	Paper Review				
	Assignments	Homework	10%	2, 4, 6 & 8	
		Class Activity	2%		
		Report	8%	5	
		Seminar	8%	8	
		Essay			
		Mini Project			
	Quiz		8%	4 & 7	
	Lab.				
	Midterm Exam		24%	6	
	Final Exam		40%	12	
	Total		100%		
<b>Specific learning outcome:</b>	The course will give the fundamental knowledge and practical abilities in the following: <ul style="list-style-type: none"> <li>• Solving first order differential equations.</li> <li>• Second and higher order differential equations.</li> <li>• Power series.</li> <li>• Laplace Transformation.</li> </ul>				

<b>Course References:</b>	<ol style="list-style-type: none"> <li>1. Advanced Engineering Mathematics by: Erwin Keryszig</li> <li>2. Advanced Engineering Mathematics by: Dennis Zill and etal.</li> <li>3. Advanced Engineering Mathematics by: Alan Jeffery</li> <li>4. Differential Equations by: George F. Simmons and Steven G. Krantz</li> </ol>
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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: Answer all questions. Laplace transform table is allowed.

**Q(1)(20Marks):** Solve the initial-value problem (IVP) if  $y(0) = 2$ :

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

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

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

**Q(3)(20Marks):** Solve the following differential equation:

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

**Q(4)(20Marks):** 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.**



**Assist. Prof. Dr. Banipal Nanno Yaqob**  
**17/9/2023**