Module (Course Syllabus) Catalogue

2023-2024

College/ Institute	**Erbil Polytechnic University**	
Department	Information System Engineering Techniques	
Module Name	Engineering Analysis	
Module Code	ENA6044	
Degree	**Technical Diploma** ☐ **Bachler** ■ **High Diploma** ☐ **Master** ☐ **PhD** ☐	
Semester	6th	
Qualification	PhD	
Scientific Title	Asst. Prof.	
ECTS (Credits)	6	
Module type	**Prerequisite** ☐ **Core** ■ **Assist.** ☐	
Weekly hours		
Weekly hours (Theory)	**(3) hr Class**	**(126) Total hrs Workload**
Weekly hours (Tutorial)	**(2) hr Class**	**(36) Total hrs Workload**
Number of Weeks	**14**	
Lecturer (Theory)	Ismael Abdulrahman	
E-Mail & Mobile NO.	ismael.abdulrahman@epu.edu.iq	
Lecturer (Practical)	Mohamed Nabi + Hawkar Jabar	
E-Mail & Mobile NO.	Mohammad.ahmmed@epu.edu.iq	
Websites		

Course Book

Course Description	This course covers several topics in engineering analysis including transformation methods and numerical analysis techniques for solving engineering problems. Some topics include (1) Taylor series which is widely used in scientific calculators, (2) Fourier series and transform that is used in communication engineering, signal analysis and image processing, (3) Laplace transform and its applications in dynamic system, control systems and differential equation systems, (4) and several important approaches for solving systems of equations numerically including Newton-Raphson method, secant method, Gaussian and Jacobian methods, and etc. Some people like to name this course “numerical analysis”, others name it “advanced engineering mathematics”. You may need to review some topics in your calculus courses including methods used in differentiation and integration. Many professional engineering and expensive softwares use algorithms based this course.
Course objectives	This course is advanced engineering mathematics. All the departments in engineering colleges study this course as a mandatory course and complementary of Calculus I and II studied earlier. The course is required by the syndicate of engineers. At the end of this course, the student learns to solve many problems in engineering using mathematical approaches. The objective is to provide and teach the students engineering tools to analyze systems mathematically and programmatically using computers. From this course, the student learns how the scientific calculator works and how to build algorithms in order to solve systems of equations that represent models of any problem in engineering.
Student's obligation	• Attendance • Quizzes / homework / simulation / seminars/reports/ projects • Exams • Homework assignments will be a mix of paperwork and electronic copies. Written homework should be finished individually, discussions with peers or instructor are allowed, but copying or any other type of cheating is strictly prohibited and will be reported to the department. You will be given one week to finish the written homework. Some of the machine problems are designed for teamwork and due day may vary. Any late submission will not be considered or incur a penalty for that assignment.

Required Learning Materials					
Evaluation	**Task**		**Weight (Marks)**	**Due Week**	**Relevant Learning Outcome**
	Paper Review				
	Assignments	Homework	10		
		Class Activity	2		
		Report	8		
		Seminar			
		Essay			
		Project	8		
	Quiz		8		
	Lab.		0		
	Midterm Exam		24		
	Final Exam		40		
	Total		100		

Specific learning outcome:

Upon completion of this course, participants will have gained knowledge in the following:

- Theoretical backgrounds on numerical methods and algorithms for analyzing and solving linear and nonlinear systems.
- Theoretical backgrounds on Taylor, Fourier, and Laplace Transformations.
- Simulation practice using MATLAB\Simulink and other programming platforms.

Course References:

- Erwin Kreyzig, Advanced Engineering mathematics, 10th ed. Columbus, Ohio.
- Gyln James, Advanced Modern Engineering Mathematics, 4th ed. Prentice Hall, 2011.

Course topics (Theory)	Week	Learning Outcome
• Fourier Series, Fourier Transform, Laplace Transform, Z-Transform. • Numerical Analysis (Newton Raphson method, fixed-point method, Gaussian method, Secant method, and other techniques). • System analysis (solution of systems).		

Practical Topics	Week	Learning Outcome
No practical.		

19. Examinations (samples of questions)

Q1: Solve $(y'' - y = t)$ using Laplace transform.

Q2: Compute 4 iterations of Newton's method to approximate the square root of 2. Use $x_0 = 1$ as the initial guess. Show the error at each iteration $(\epsilon_i = |x_{i+1} - x_i|)$ and its ratio $\left(\frac{\epsilon_{i+1}}{\epsilon_i}\right)$. Put your steps in a table. Repeat the same procedure for $x_0 = -1$. Comment on both results.

Extra notes:

This course is a mandatory course required by the Syndicate of Engineers for all engineering departments in the country and the region.

External Evaluator

I confirm that the syllabus given the attached course book is sufficient and covers the required areas needed for the students.

Assist. Lect. Najat Yohana Danha