Kurdistan Region Government
Ministry of Higher Education
and Scientific Research
Erbil Polytechnic University

زانکۆی پۆلیتەکنیکی هەولێر
ERBIL POLYTECHNIC UNIVERSITY

Module (Course Syllabus) Catalogue

2022-2023

College/ Institute	Technical Engineering College, Erbil Polytechnic University
Department	Department of Highway and Bridge Engineering
Module Name	Engineering Analysis and Numerical Methods
Module Code	EAN605
Degree	Technical Diploma ☐ Bachelor ☒ High Diploma ☐ Master ☐ PhD ☐
Semester	6th
Qualification	
Scientific Title	PhD holder
ECTS (Credits)	3
Module type	Prerequisite ☐ Core ☒ Assist. ☐
Weekly hours		
Weekly hours (Theory)	(2) hr Class	(3 credits *27=81) Total hrs Workload
Weekly hours (Practical)	(0) hr Class	(0) Total hrs Workload
Number of Weeks	12
Lecturer (Theory)	Hawreen Hasan Ahmed
E-Mail & Mobile NO.	07502803939
Lecturer (Practical)	None
E-Mail & Mobile NO.	None
Websites	https://scholar.google.com/citations?user=xSn7en4AAAAJ&hl=en&oi=ao https://academicstaff.epu.edu.iq/faculty/Hawreen.ahmed

Course Book

Course Description	This course deals with more Engineering Analysis and Numerical Methods topics which provide students with the relevant mathematical tools required in the analysis of problems in engineering and scientific professions. The mathematical skills derived from this course form a necessary base to analytical and design concepts encountered in the program. The course provides mathematical techniques in the more advanced areas of mathematics that are of most relevance to engineering disciplines. Applications of these techniques for the solution of boundary value and initial value problems will be given. The problems treated and solved in this course are typical of those seen in applications and include problems of mixing problems, mechanical vibrations and beam bending.
Course objectives	The objective of Engineering Analysis and Numerical Methods is for students to learn the basics of Modeling and solution of differential equations. They will study standard functions with graph, geometrical meaning of differential equations, modeling and solution of ordinary and partial differential equations also application of Laplace transform, Fourier series and Fourier integral. More generally, the students will improve their ability to think critically, to analyze a real problem and solve it using a wide array of mathematical tools. They will also be able to apply these ideas to a wide range of problems that include the engineering equations. The students should be able to interpret the concepts of modeling algebraically, graphically and verbally.
Student's obligation	Students should attend in all the lectures except what is allowed by university regulations. They should attend quizzes, exams and do their homework, this is in addition to the assignments which can carry considerable credits.
Required Learning Materials	All the lectures will be given with the aid of projector, using PowerPoint presentations. Students will have access to the handouts.

	Task	Weight (Marks)	Due Week	Relevant Learning Outcome
Evaluation	Paper Review			
	Assignments — Homework	10		
	Assignments — Class Activity	2		
	Assignments — Report			
	Assignments — Seminar	8		
	Assignments — Essay	8		
	Assignments — Project			

	Quiz	8		
	Lab.	0		
	Midterm Exam	24		
	Final Exam	40		
	Total	100		

Specific learning outcome:	After successful completion of the course, students are expected to have 1. an ability to apply knowledge of mathematics, and engineering; 2. an ability to identify, formulate, and solve engineering problems; 3. an ability to analyse complex problems to determine the relevant mathematical principles and then apply that knowledge to solve civil engineering problems; **And specifically, they can** 4. Solve ordinary differential equations; 5. Solve systems of ordinary differential equations; 6. Solve differential equations by Laplace transform; 7. Solve differential equations by Fourier series; 8. Solve Partial differential equations; 9. Solve Matrices; 10. Solve Complex Variable Functions; 11. Create models of Engineering problems.
Course References:	i. Erwin Kreyszig "Advanced Engineering Mathematics", 10th edition, 2011 (TEXT BOOK) ii. Peter V. O'Neil "Advanced Engineering Mathematics", 7th edition, 2012. (TEXT BOOK) iii. Michael D. Greenberg "Advanced Engineering Mathematics ", 2nd edition 1998. iv. Alan Jeffrey" Advanced Engineering Mathematics ", 2002 v. Dean G. Duffy" Advanced Engineering Mathematics ", 1998 vi. C.R. Wylie" Advanced Engineering Mathematics " F.B. Hildbrand "Advanced Calcululs for Applications"

Course topics (Theory)	Week	Learning Outcome
i. First order Differential Equations ii. Partial Differential Equations iii. Linear Differential Equations with constant equations iv. Review of Matrices v. Fourier Series vi. Laplace equations vii. Linear Interpolations viii. Numerical Solutions Optimization	12	It is written above.

Practical Topics	Week	Learning Outcome
None	None	None

Questions Example Design

Solving Problems
Such as solve, derive, find, determine, ... etc.
Explanations and graphing
Such as explain, why, show that, prove that ..., etc.
Number of Questions: 3-6
Number of Assignments: 2-4
Recommendations for Students at Exams
• Read the questions carefully and at least twice.
• Think about the answers and don't hurry.
Answer the questions with the easiest first
At the end, review the answers.

Extra notes:

For the above time schedule, 12 weeks of teaching is considered, hence, the completion of the program is dependent on the available number of weeks. However, some changes might happen to optimize the available time.

External Evaluator

I hereby confirm that all syllabuses given in the attached course book is sufficient to cover required subjects, areas and titles needed for students regarding the study year.

Ahmed S.Ali

Ahmed Suad Ali:
Head of QA/QC committee of Highway and Bridges Engineering Department 2019-2020/2020-2021/2021-2022/2022-2023