



Course Specification

(Bachelor)

Course Title: **Engineering Analysis 1**

Course Code: **IE2101**

Program: **Bachelor of Science in Industrial Engineering**

Department: **Mechanical and Industrial Engineering Department**

College: **College of Engineering and Computing in Al-Qunfudhah**

Institution: **Umm Al-Qura University**

Version: **2**

Last Revision Date: **17 March 2025**



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A. General information about the course:

1. Course Identification

1. Credit hours: (4 Hours)

2. Course type

A. University College Department Track Others

B. Required Elective

3. Level/year at which this course is offered: 3rd Semester / 2nd Year, First term

4. Course General Description:

This course is designed to provide a comprehensive understanding of the complex number, basic concepts of ordinary differential equations, general and particular solutions, initial and boundary conditions, linear and nonlinear differential equations, solution of first and second order differential equations and their applications, Laplace transform. higher order differential equations, theory of operators and applications, introduction to partial differential equations.

5. Pre-requirements for this course (if any):

MTH1182 - Calculus (2) for Engineering, 4 Credit Hours

6. Co-requisites for this course (if any):

7. Course Main Objective(s):

The main purpose of this course is to prepare students to understand the fundamental ideas of complex numbers and their geometric representation on the Argand diagram, know the types of differential equations, recognize the basic notions of linear and nonlinear differential equations, ordinary and partial differential equations, solve partial differential equations (especially heat and wave) with applications to engineering problems, set-up systems of linear differential equations using characteristic equations, and apply Partial derivatives of functions of multi-variables, on direct applications within the engineering disciplines (Industrial, Mechanics, and Civil). Engineering problems can be modelled from physical phenomena, and then the methods of solution can be applied to identify real-world engineering applications (Industrial, Mechanics, and Civil).



2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	60	100%
2	E-learning		
3	Hybrid <ul style="list-style-type: none"> Traditional classroom E-learning 		
4	Distance learning		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	60
2.	Laboratory/Studio	
3.	Field	
4.	Tutorial	
5.	Others (specify)	
Total		60

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	know the types of differential equations	K1	<ul style="list-style-type: none"> Lectures Homework Interactive and independent learning 	<ul style="list-style-type: none"> Mid and Final exams) Regular quizzes per chapter Evaluated homework Assignments
1.2	Understanding of the fundamental ideas of complex numbers	K1		
1.3	Recognize the basic notions linear and nonlinear differential equations, ordinary and partial differential equations	K1		
1.4	Set-up systems of linear differential equations using characteristic equations	K2		

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
2.0	Skills			
2.1	Solving Equations with Complex Numbers	S1	<ul style="list-style-type: none"> • Lectures • Homework • Interactive and independent learning 	<ul style="list-style-type: none"> • Mid and Final exams) • Quiz per unit • Evaluated homework • Assignments
2.2	Analyze partial differential equations (especially heat and wave) with applications to engineering problems.	S2		
3.0	Values, autonomy, and responsibility			
3.1	NA			
3.2				



C. Course Content

No	List of Topics	Contact Hours
1.	Complex Numbers	8
2.	Introduction to differential equations	8
3.	First order differential equations	8
4.	Second order linear differential equations	6
5.	Laplace Transform	8
6.	Systems of two linear differential equations	6
7.	Nonlinear differential equations and stability	8
8.	Introduction to partial differential equations & its applications	8
Total		60

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Quiz 1	During 5 th Week	10%
2.	Homework Assignments	Continuous Assessment	10%
3.	General Performance /Attendance	Continuous Assessment	5%
4.	Midterm Exam	During 7th-8th Weeks	25%
5.	Quiz 2	During 12 th Week	10%
6.	Final Exam	16 th – 17 th Weeks	40%

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	<ol style="list-style-type: none"> Elementary Differential Equations”, W.E. Boyce and R.C. Diprima: 12th edition, John Wiley & Sons, 2021. Advanced Engineering Mathematics, Erwin Kreyszig, 11th. Edition, Wiley, 2025. Advanced Engineering Mathematics, Dennis G. Zill and Warren S. Wright, 7th. Edition, Jones and Bartlett Publishers, 2020. Fundamentals of differential equations and boundary value problems, R. Nagle, E. Saff and A. Sinder, 7th. Edition, Pearson, 2017.
Supportive References	
Electronic Materials	PowerPoint Slides provided by instructor.
Other Learning Materials	

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	<ul style="list-style-type: none"> Classroom
Technology equipment (projector, smart board, software)	<ul style="list-style-type: none"> Projector to be Available
Other equipment (depending on the nature of the specialty)	<ul style="list-style-type: none"> NA

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	Indirect: Survey
Effectiveness of Students assessment	External Assessors	Direct: Q. Committee , Deanship of Improvement and Quality
Quality of learning resources	Program Leaders, Peer Reviewers	Direct: Stakeholders, Quality requirements, Deanship of Improvement and Quality
The extent to which CLOs have been achieved	Instructor, Q. Committee	Direct: Mid exam, HW, Quizzes, Project and Final Exam
Other	Students	Indirect: Survey

Assessors (Students, Faculty, Program Leaders, Peer Reviewers, Others (specify))

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	Department of Mechanical and Industrial Engineering
REFERENCE NO.	The fifteenth session of the academic year 1446
DATE	06/11/1446

