



Course Specification

— (Bachelor)

Course Title: Ordinary Differential Equations

Course Code: 2022201-4

Program: Bachelor in Mathematics

Department: Mathematics and Statistics Department

College: Faculty of Sciences

Institution: Taif University

Version: 1

Last Revision Date: 20/05/2023



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A. General information about the course:

1. Course Identification

1. Credit hours: 4 (3,1,0) h

2. Course type

A. University College Department Track Others

B. Required Elective

3. Level/year at which this course is offered: Level 4 / Second Year

4. Course general Description:

This course introduces ordinary differential equations. Study the first order differential equation and the methods for solving it such as, separation of variables, homogeneous equations, exact equations, linear equations, Bernoulli's Equations and Ricatti's Equation. Illustrate the nonlinear first order differential equation and the methods for solving it. Study the second and higher order differential equation with constant and variable coefficient, Homogeneous and non-homogeneous equations, Operator's method, undetermined coefficient, variation of parameters method for solving the higher order differential equations. Use the power series for solving the ordinary differential equations. Study the Laplace transform and using the Laplace for solving the differential equation.

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

Calculus II (2022104-4)

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

None

7. Course Main Objective(s):

The student will be taught as follows:

1. Describing the differential equations and types of the differential equation.
2. Demonstrating all methods for solving the ordinary differential equation and its applications.

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	4Hr /Week	100%
2	E-learning		



No	Mode of Instruction	Contact Hours	Percentage
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	NA
3.	Field	NA
4.	Tutorial	NA
5.	Others (specify)	NA
Total		60

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

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	Describe the methods for solving the ordinary differential equations.	K2	<ul style="list-style-type: none"> Lectures Group discussions 	<ul style="list-style-type: none"> Quizzes Assignments
1.2	Outline the series method and Laplace transformations for solving the ordinary differential equations.	K2	<ul style="list-style-type: none"> Lectures Group discussions 	<ul style="list-style-type: none"> Exams Assignments
2.0	Skills			
2.1	Apply the method for solving the first and higher order ordinary differential equations.	S5	<ul style="list-style-type: none"> Interactive classes Group discussions 	<ul style="list-style-type: none"> Quizzes Assignments
2.2	Demonstrate the solutions of ordinary differential equations by using the power series and Laplace	S5	<ul style="list-style-type: none"> Lectures Group discussions 	<ul style="list-style-type: none"> Exams Quizzes



Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	transformation			
2.3	Use the ordinary differential equations in some problems in applied sciences and mathematical physics.	S5	<ul style="list-style-type: none"> Lectures Self-learning through the website 	<ul style="list-style-type: none"> Exams Quizzes Assignments
3.0	Values, autonomy, and responsibility			
3.1	Demonstrate act responsibility and ethically in conducting their assignment	V3	<ul style="list-style-type: none"> Lectures 	<ul style="list-style-type: none"> Assignments
...				

C. Course Content

No	List of Topics	Contact Hours
1.	Introduction to the course (description of the course, discussion on the textbooks related to the course, teaching strategies and assessment methods) A general review on some essential notions in analysis related to the course. Basic concepts and composition of ordinary differential equation	4
2.	Solve the differential equation of the first order and first-degree (Separation of variables and Homogeneous)	4
3.	Solve the differential equation of the first order and first-degree (Non-Homogeneous Equations, Exact differential equations)	4
4.	Solve the differential equation of the first order and first-degree (Integrating factors, First-order Linear equation	4
5.	Solve the differential equation of the first order Bernoulli's Equations, Ricatti's Equation)	4
6.	Solve the nonlinear differential equation of the first order and higher degree	4
7.	First Midterm exam	4
8.	ODEs of second order and higher orders: an introduction, superposition theorems, set of fundamental solutions, worskian	4
9.	Homogeneous Linear Second order and Higher-order Differential Equations with the constant coefficient	4
10.	Non-Homogeneous Linear Second order and Higher-order Differential Equations with the constant coefficient	4
11.	Linear Second order and Higher-order Differential Equations with variables coefficient.	4
12	Series solutions of linear equations: an introduction to power series, ordinary points, singular points, application of series method	4



	around regular points to solve an ODE.	
13.	Second Midterm exam	4
14.	Laplace transforms: definition of Laplace transforms, inverse transforms, transforms of derivatives.	4
15.	Application of Laplace transform to solve an initial value problem	4
Total		60

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Quizzes	Continuous Evaluation	10 %
2.	Assignments, report	Continuous Evaluation	10 %
3.	Midterm 1 Exam	8-9	15%
4.	Midterm 2 Exam	12-13	15%
5.	Final Exam	15-16	50%

*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	Steven Krantz, Differential Equations Demystified, <u>McGraw-Hill Professional Publishing</u> , 1st edition 2004.
Supportive References	Bronson, Richard Book: Schaum's outlines of differential equations Publisher: McGraw-Hill Professional Publishing 2010.
Electronic Materials	Lectures available in Blackboard
Other Learning Materials	Matlab tutorial

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classrooms
Technology equipment (Projector, smart board, software)	Data show, Blackboard
Other equipment (Depending on the nature of the specialty)	None



F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students, Program Leader	Direct & Indirect
Effectiveness of students' assessment	Faculty, Program Leader	Direct
Quality of learning resources	Students, Faculty	Indirect
The extent to which CLOs have been achieved	Faculty	Direct & Indirect
Other		

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	Department Council
REFERENCE NO.	4
DATE	October 2023

