Course Specification
(Bachelor)

Course Title:	**Differential Equations 2**
Course Code:	**332MATH-3**
Program:	**Mathematics**
Department:	**Mathematics**
College:	**Science**
Institution:	**Jazan University**
Version:	**2024**
Last Revision Date:	**9/2024**

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours:	3 hours

2. Course type

A.	University ☐	College ☐	Department☒	Track☐	Others☒
B.	Required ☒		Elective☐		

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

Level 6 / Year 3

4. Course general Description

This course is designed to provide students with

- Higher order differential equations with variables coefficients
- System of differential equations
- Method of undetermined coefficients to solve differential equations and system of differential equations
- Method of variation of parameters to solve differential equations and system of differential equations
- Stability of system solution.
- Power series solution of differential equations

5. Pre-requirements for this course (if any): 331 math

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

7. Course Main Objective(s)

- Solve higher order linear differential equations with variables coefficients
- Solve system of linear differential equations
- Use method of variation of parameters to solve nonhomogeneous linear differential equations and system of differential equations
- Use method of undetermined coefficients to solve nonhomogeneous linear differential equations and system of differential equations
- Use power series to solve differential equations
- Find stability of system solution.

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	45	100%
2.	E-learning		
3.	Hybrid • Traditional classroom		

No	Mode of Instruction	Contact Hours	Percentage
	• E-learning		
4.	Distance learning		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	42
2.	Laboratory/Studio	
3.	Field	
4.	Tutorial	3
5.	Others (specify)	
	Total	45

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	Distinguishing mathematical concepts relevant to higher order differential equations with variables coefficients, system of differential equations, methods of undetermined coefficients and variation of parameters to solve nonhomogeneous differential equations and system of nonhomogeneous differential equations, power series solution of differential equations and stability of solution.	K1	Lectures, Web based work, Classroom dissections.	Written exam (Problem solve, MCQ, true/false, Proof, Short answer), Quizzes, Assignments
1.2	Identify background science, features, and structures of Mathematics problems in higher order differential equations with variables coefficients, system of differential equations, methods of undetermined coefficients and variation of parameters to solve nonhomogeneous differential equations and system of nonhomogeneous differential equations, power series solution of differential equations, and stability of solution.	K2	Lectures, Web based work, Classroom dissections.	Written exam (Problem solve, MCQ, true/false, Proof, Short answer), Quizzes, Assignments
1.3	Explain notations and concepts required for the higher order differential equations	K3	Lectures,	Written exam (Problem solve,

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	with variables coefficients, system of differential equations, and methods of undetermined coefficients and variation of parameters to solve nonhomogeneous differential equations and system of nonhomogeneous differential equations, power series solution of differential equations, and stability of solution.		Web based work, Classroom dissections.	MCQ, true/false, Proof, Short answer), Quizzes, Assignments
2.0	Skills			
2.1	Apply theoretical, computational, or practical aspect relevant to higher order differential equations with variables coefficients, system of differential equations, methods of undetermined coefficients and variation of parameters to solve nonhomogeneous differential equations and system of nonhomogeneous differential equations, power series solution of differential equations and stability of solution.	S1	Lectures, problem solving, web-based work, Classroom dissections.	Written exam (Problem solve, MCQ, true/false, Proof, Short answer), Quizzes, Assignments
2.2	Compute numerical quantities for various parameters to approximate the solution in higher order differential equations with variables coefficients, system of differential equations, methods of undetermined coefficients and variation of parameters to solve nonhomogeneous differential equations and system of nonhomogeneous differential equations, power series solution of differential equations and stability of solution.	S2	Lectures, problem solving, web-based work, Classroom dissections.	Written exam (Problem solve, MCQ, true/false, Proof, Short answer), Quizzes, Assignments
2.3	Apply various mathematical rules, techniques, and theorems in higher order differential equations with variables coefficients, system of differential equations, methods of undetermined coefficients and variation of parameters to solve nonhomogeneous differential equations and system of nonhomogeneous differential equations, power series solution of differential equations, and stability of solution.	S3	Lectures, problem solving, web-based work, Classroom dissections.	Written exam (Problem solve, MCQ, true/false, Proof, Short answer), Quizzes, Assignments

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
2.4	Solve mathematical problem using critical thinking for higher order differential equations with variables coefficients, system of differential equations, methods of undetermined coefficients and variation of parameters to solve nonhomogeneous differential equations and system of nonhomogeneous differential equations, power series solution of differential equations, and stability of solution.	S4	Lectures, problem solving, web-based work, Classroom dissections.	Written exam (Problem solve, MCQ, true/false, Proof, Short answer), Quizzes, Assignments
3.0	Values, autonomy, and responsibility			
3.1	Cultivate a mathematical attitude and nurture the interest.	V1	Group work, problem solving, web-based work	Assignments, Discussion
3.2	Leadership qualities in research and innovation with sense of Commitment and accountability.	V2	Group work, problem solving, web-based work	
3.3	Inculcating values and ethics in thought, expression, and deed.	V3	Group work, problem solving, web-based work	

C. Course Content

No	List of Topics	Contact Hours
1.	Higher order differential equations with variables coefficients	5
2.	Use the method of undetermined coefficients to solve nonhomogeneous differential equations	5
3	Use variation of parameters to solve nonhomogeneous differential equations	5
4	System of differential equations and boundary value problems	11

5	Stability of solution.	8
6	Use power series to solve differential equations	11
Total		45

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Homework 1	3	2.5%
2.	Quiz 1	4	2.5%
3.	First exam	6	20%
4.	Quiz 2	8	2.5%
5.	Second exam	11	20%
6.	Homework 2	12	2.5%
7	Final exam.	15	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	Dennis G. Zill, A First Course in Differential Equations, 8th edition, 2005.
Supportive References	Blanchard. P. R -2006, Differential Equations, 3rd ed. Boston University
Electronic Materials	Web sites dedicated to Numerical Methods available on the internet
Other Learning Materials	YouTube channel

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classroom
Technology equipment (projector, smart board, software)	Data show – Smart Board.
Other equipment (depending on the nature of the specialty)	Blackboard

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students, Peer and program leader	Indirect (Course Evaluation Survey)- Indirect peer evaluation
Effectiveness of students assessment	Students, Program assessment committee	Direct/ Indirect
Quality of learning resources	Students, Faculty members	Indirect
The extent to which CLOs have been achieved	Students, Program assessment committee	Direct/Indirect
Other		

Assessor (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval Data

COUNCIL /COMMITTEE	**Board Of Mathematics Department**
REFERENCE NO.	**2417**
DATE	**29/03/1446 A. H.; 2/10/2024 A. D.**