هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

Course Specifications

Course Title:	**Differential Equations 2**
Course Code:	**332 Math**
Program:	**B. Sc. in Mathematics**
Department:	**Mathematics**
College:	**Science**
Institution:	**Jazan University**

Table of Contents

A. Course Identification

1. Credit hours: 3
2. Course type **a.** University ☐ College ☐ Department ☑ Others ☐ **b.** Required ☑ Elective ☐
3. Level/year at which this course is offered: Level 6/Year 3
4. Pre-requisites for this course (if any)**: 331 Math**
5. Co-requisites for this course (if any)**:**

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	45	100%
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	**42**
2	**Laboratory/Studio**	
3	**Tutorial**	**3**
4	**Others** (specify)	
	Total	**45**

B. Course Objectives and Learning Outcomes

1. Course Description

This course is designed to provide students with

- Higher order differential equations with variables coefficients
- System of differential equations
- Method of variation of parameters to solve differential equations
- Method of undetermined coefficients to solve differential equations
- Power series solution of differential equations
- Boundary value problems
- Stability of solution

2. Course Main Objective

After finishing the course, the student is expected to be familiar with the following:

- higher order differential equations with variables coefficients
- system of _differential equations
- use variation of parameters to solve differential equations
- use the method of undetermined coefficients to solve differential equations
- use power series to solve differential equations

boundary value problems

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Distinguish mathematical concepts relevant to higher order differential equations with variables coefficients, system of differential equations, method of variation of parameters to solve differential equations, method of undetermined coefficients to solve differential equations, power series solution of differential equations, boundary value problems, and stability of solution.	K1
1.2	Identify background science, features and structures of Mathematics problems in higher order differential equations with variables coefficients, system of differential equations, and method of variation of parameters to solve differential equations, method of undetermined coefficients to solve differential equations, power series solution of differential equations, boundary value problems, and stability of solution.	K2
1.3	Explain notations and concepts required for the solution of higher order differential equations with variables coefficients, system of differential equations, and method of variation of parameters to solve differential equations, method of undetermined coefficients to solve differential equations, power series solution of differential equations, boundary value problems, and stability of solution.	K3
2	**Skills:**	
2.1	Apply theoretical, computational or practical aspect relevant to higher order differential equations with variables coefficients, system of differential equations, method of variation of parameters to solve differential equations, method of undetermined coefficients to solve differential equations, power series solution of differential equations, boundary value problems, and stability of solution.	S1
2.2	Compute numerical quantities for various parameters to approximate the solution in higher order differential equations with variables coefficients, system of differential equations, method of variation of parameters to solve differential equations, method of undetermined coefficients to solve differential equations, power series solution of differential equations, boundary value problems, and stability of solution.	S2
2.3	Apply various mathematical rules, techniques and theorems in higher order differential equations with variables coefficients, system of differential equations, and method of variation of parameters to solve differential equations, method of undetermined coefficients to solve differential equations, power series solution of differential equations, boundary value problems, and stability of solution.	S3
2.4	Solve mathematical problem using critical thinking for higher order differential equations with variables coefficients, system of differential equations, method of variation of parameters to solve differential equations, method of undetermined coefficients to solve differential equations, power series solution of differential equations, boundary value problems, and stability of solution.	S4
3	**Values:**	
3.1	Cultivate a mathematical attitude and nurture the interest.	V1

CLOs		Aligned PLOs
3.2	Realize the importance of responsibilities through different modes of practice, competition and related activities.	V2
3.3	Inculcating values and ethics in thought, expression and deed.	V3

C. Course Content

No	List of Topics	Contact Hours
1	Higher order differential equations with variables coefficients	9
2	Use variation of parameters to solve differential equations	9
3	Use the method of undetermined coefficients to solve differential equations	9
4	System of differential equations and boundary value problems	9
5	Use power series to solve differential equations	9
Total		45

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	Distinguish mathematical concepts relevant to higher order differential equations with variables coefficients, system of differential equations, method of variation of parameters to solve differential equations, method of undetermined coefficients to solve differential equations, power series solution of differential equations, boundary value problems, and stability of solution.	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, and method of variation of parameters to solve differential equations, method of undetermined coefficients to solve differential equations, power series solution of differential equations, boundary value problems, and stability of solution.		
1.3	Explain notations and concepts required for the solution of higher order differential equations with variables coefficients, system of differential		

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
	equations, and method of variation of parameters to solve differential equations, method of undetermined coefficients to solve differential equations, power series solution of differential equations, boundary value problems, and stability of solution.		
2.0	**Skills:**		
2.1	Apply theoretical, computational or practical aspect relevant to higher order differential equations with variables coefficients, system of differential equations, method of variation of parameters to solve differential equations, method of undetermined coefficients to solve differential equations, power series solution of differential equations, boundary value problems, and stability of solution.	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, method of variation of parameters to solve differential equations, method of undetermined coefficients to solve differential equations, power series solution of differential equations, boundary value problems, and stability of solution.		
2.3	Apply various mathematical rules, techniques and theorems in higher order differential equations with variables coefficients, system of differential equations, and method of variation of parameters to solve differential equations, method of undetermined coefficients to solve differential equations, power series solution of differential equations, boundary value problems, and stability of solution.		
2.4	Solve mathematical problem using critical thinking for higher order differential equations with variables coefficients, system of differential equations, method of variation of parameters to solve differential equations, method of undetermined coefficients to solve differential equations, power series solution of differential equations, boundary value problems, and stability of solution.		
3.0	**Values:**		
3.1	Cultivate a mathematical attitude and nurture the interest.	Group work, problem solving, web based work	Assignments
3.2	Realize the importance of responsibilities through different modes of practice, competition and related activities.		
3.3	Inculcating values and ethics in thought, expression and deed.		

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Homework	3	5%
2	First exam.	7	20%
3	Second exam.	13	20%
4	Homework	14	5%
5	Final exam.	16	50%

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

Each group of students assigned to a member of staff who will be available for help and academic guidance office hours at specific hours on daily basis. At least be available 8 hours per week.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	Dennis G. Zill, A First Course in Differential Equations, 8th edition, 2005.
Essential References Materials	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	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classroom, Computer Lab.
Technology Resources (AV, data show, Smart Board, software, etc.)	Data show; Smart Board, Mathematics software.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching	Students, Peer and program leader	Indirect (Course Evaluation Survey)- Indirect peer evaluation
Assessment	Students, Program assessment committee	Direct/ Indirect
Extent of achievement of course learning outcomes	Instructor	Direct/Indirect
Quality of learning resources	Students, Faculty members	Indirect

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	**Board Of Mathematics Department**
Reference No.	**12th Meeting Of The Board Of Mathematics Department 1441-1442**
Date	**14/6/1442 A. H.; 27/1/2021 A. D.**