Faculty: Science	
Department: Mathematics	**Program: Master**
Academic year: 2023/2024	**Semester: Second**

Course Plan

First: Course Information

Course No. 0301756	*Course Title:* Theory of ordinary differential equations	*Credit Hours:* 3
Prerequisite:	*Section No.*: 1	*Lecture Time:* 4:30-6:30*pm*
Type Of Course:	☐ *Obligatory Faculty Requirement* ☐ *Elective University Requirement* ☐ *Obligatory University Requirement* ☐ *Faculty Requirement* ☐ *Course Elective Specialty Requirement* ■ *Obligatory Specialization requirement*	
Type of Learning:	☐ *Face-to-Face Learning* ■ *Blended Learning (1 Face-to-Face + 1Asynchronous)* ☐ *Online Learning (2 Synchronous+1 Asynchronous)*	

Second: Instructor's Information

Name: Rania Saadeh	*Academic Rank:* Associate Professor	
Office Number: 322 د	*Phone Number:* 2215	*Email:* rsaadeh@zu.edu.jo
Office Hours: 14:00-15:00	*Sunday…. Tuesday…. Thursday*	

Third: Course Description

Review of ODEs, existence and uniqueness of solutions for ODEs, existence and uniqueness of solutions for systems. Sturm-Louiville's theory and orthogonal functions. Non-linear ODEs and their stability.

Fourth: Learning Source

Main Reference:	**Fundamentals of Differential Equations and Boundary Value Problems**	
Author: Nagle, Saff and Snider	*Issue No.:*	*Publication Year*: 2012
Additional Sources & Websites:	• **Zill and Wright. Differential Equations, 2013.** • **Coddington. An introduction to ordinary differential equations, 1961.** • **Brauer and Nohel. The Qualitative theory of ordinary differential equations, 1989.**	
Teaching Type:	■ *Classroom* ☐ *Laboratory* ☐ *Workshop* ☐ *MS Teams* ■ *Moodle*	

Fifth: Learning Outcomes

Course Code	*Course Intended Learning Outcomes (CILOs)*	*Connection To Program ILOs Code*
Knowledge		
K1	Understand the fundamental concepts and theories behind Ordinary Differential Equations (ODEs).	PK1
K2	Grasp the conditions necessary for the existence and uniqueness of solutions for ODEs and systems of ODEs.	PK1
K3	Acquire knowledge of Sturm-Liouville theory and its role in orthogonal functions.	PK1
K4	Familiarize with the characteristics and solutions of non-linear ODEs, including stability criteria.	PK2
Skills		
S1	Apply rigorous mathematical techniques like advanced calculus and linear algebra for solving and analyzing ODEs.	PS1, PS3
S2	Utilize computational tools for approximating and interpreting solutions to ODEs.	PS3
S3	Critically evaluate and adapt various methods used in solving differential equations for complex problems.	PS1
S4	Conduct literature reviews and integrate existing research into problem-solving approaches in the field of ODEs.	PS2
Competencies		
C1	Effectively collaborate with peers on complex problems related to ODEs, synthesizing multiple viewpoints to arrive at a solution.	PC1
C2	Clearly communicate mathematical ideas, both orally and in writing, in a manner accessible to both specialists and non-specialists.	PC2
C3	Demonstrate the ability to apply theoretical knowledge to real-world applications, showing adaptability and problem-solving prowess.	PC3

*K: knowledge, **S: skills, ***C: competencies.

Sixth: Course Structure

Lecture Date	Intended Teaching Outcomes(ILOs)	Topics	Teaching Procedures*	Teaching Methods***	References***
6/3	K1, S1	Systems of 1st order equations, Linear homogeneous systems. The solution matrix, fundamental matrix.	Face-to-Face	Lectures and discussion	
13/3	K1, K2	Activity No. 1 Review of ODEs	Asynchronous.	Exercises and participation	
20/3	K2, S1	Existence and uniqueness for linear systems, Abel's formula.	Face-to-Face	Lectures and discussion	
27/3	S1, S2	Activity No. 2 Hands-on computational exercises.	Asynchronous	Discussion on a forum (Group activity focused on computational problem-solving)	
4/4	K3, S1	The function of Exp. matrix.	Face-to-Face	Lectures and discussion	
11/4	S3, S4	Activity No. 3 Short presentation on a selected paper	Asynchronous	Literature review and discussion.	
18/4	K4, S1	Linear non-homogeneous systems.	Face-to-Face	Lectures and problem-solving exercises	
25/4	C1, C2	Activity No. 4 Peer-reviewed group activity	Asynchronous	Group discussions, peer review	
1/5	عطلة عيد العمال				
8/5	K2, S3	The method of successive approximations. The Lipchitz condition. Gronwall inequality.	Face-to-Face	Lectures and discussion	Midterm Exam
15/5	K2, S1	Existence and uniqueness theorem Continuous	Face-to-Face	Lectures and problem-solving exercises	

22/5	C2, C3	Activity No. 5 Oral presentation and peer review	asynchronous.	Oral presentations, group discussions..	
29/5	K4, S3, C3	Dependence of solution on initial condition. Phase plane and phase portrait: critical points	Face-to-Face	Lectures and workshops on phase plane and phase portrait	
5/6	K4, S3, C3	Phase plane and phase portrait: critical points.	Face-to-Face	Lectures and workshops on phase plane and phase portrait	
		Activity No. 6	asynchronous	Quiz over a video	
9/6-25/6	Final Exam				

* Learning procedures: (Face-to-Face, synchronous, asynchronous). * * Teaching methods: (Lecture, video…..). ** * Reference: (Pages of the book, recorded lecture, video….).

Seventh: Assessment methods

Methods	Online Learning	Blended Learning	Face-To-Face Learning	Measurable Course (ILOs)
First Exam		0		
Second Exam		0		
Mid-term Exam		30		
Participation		0		
Asynchronous Activities		30		
Final Exam		40		

Eighth: Course Policies

- All course policies are applied on all teaching patterns (online, blended, and face-to-face Learning) as follows:
  a. Punctuality.
  b. Participation and interaction.
  c. Attendance and exams.
- Academic integrity: (cheating and plagiarism are prohibited).

Approved by:	Name	Date	Signature
Head of Department	Dr. Radwan Abu-Gdairi	3-3-2024	
Faculty Dean	Dr. Ibrahim Ghbar	3.3.2024	