Course Specification
— (Bachelor)

Course Title: **Differential Equations**

Course Code: 2023103-4

Program: Bachelor in Mathematics

Department: Mathematics and Statistics Department

College: **Faculty of Sciences**

Institution: **Taif University**

Version: 1

Last Revision Date: 20/05/2023

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours: 4

2. Course type

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

3. Level/year at which this course is offered: Level 5 / Third Year

4. Course general Description:

In this course, we will study the total differential equations and methods for solving them, definition of partial differential equations (PDEs), formation of PDEs, solving PDEs of the first order in different ways, solving PDEs of second order with constant coefficients homogeneous and non-homogeneous. We explain the method for solving PDEs of second order with constant coefficients with irregular order homogeneous and non-homogeneous and solve PDEs with variable coefficients. We explain the method of separation of variables to solve PDEs. Solving hyperbolic, Elliptic and parabolic PDEs and PDEs of non-linear first order. Solving PDEs by using Laplace transformation.

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

Ordinary differential equations (2022201-4)

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

None

7. Course Main Objective(s):

The student will be taught as follows:
1. Describing the total differential equations in the three variables and the methods for solving its.
2. Recognizing the different methods for solving the linear and nonlinear partial differential equations.

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	**4Hr /Week**	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**	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	**Memorize** the various methods for solving partial differential equations.	K2	● Lectures ● Group discussions `	● Quizzes ● Assignments
1.2	**Outline** the difference between kinds of partial differential equations.	K2	● Lectures ● Group discussion	● Exams ● Assignments
2.0	**Skills**			
2.1	**Explain** basic concepts of analytical solutions for the partial differential equations.	S5	● Interactive classes ● Group discussions	● Quizzes ● Assignments
2.2	**Analyze** the different types of the partial differential equations.	S5	● Lectures ● Group discussion	● Exams ● Quizzes
2.3	**Show** the partial differential equations in some problems in applied sciences and mathematical physics	S5	● Lectures ● Self-learning through the website	● Exams ● Quizzes ● Assignments

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
3.0	**Values, autonomy, and responsibility**			
3.1	**Work** effectively within groups and independently.	V1	• Projects	• Through the oral presentation of the projects

C. Course Content

No	List of Topics	Contact Hours
1.	Review of Calculus III and some techniques of solving ODEs.	4
2.	Introduction - Total differential equations and methods of solving them	4
3.	Definition of partial differential equations, Formation of partial differential equations	4
4.	Solving partial differential equations of the first order in different ways	4
5. 6.	Nonlinear first order Partial differential equation in the different ways and methods for solving the nonlinear first order PDE's.	8
7.	**First Midterm exam**	4
8.	Solving homogeneous partial differential equations of second order with constant coefficients	4
9.	Solving nonhomogeneous partial differential equations of second order with constant coefficients	4
10.	Solving partial differential equations with variable coefficients and Cauchy Euler problem	4
11. 12	Classification of PDE's, Solving hyperbolic, Elliptic and parabolic partial differential equation Parabolic partial differential equation.	8
13.	**Second Midterm exam**	4
14.	The separation variables method to solve the PDE's.	4
15	Laplace transformation to solve the PDE's.	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	Ravi P. Agarwal and Donal O'Regan,Ordinary and Partial Differential Equations, 1 edition, Springer Verlage 2009.
Supportive References	Victor Henner, Tatyana Belozerova, Mikhail Khenner, Ordinary and Partial Differential Equations, A K Peters/CRC Press; 1 edition (28 February 2013)
Electronic Materials	http://fac.ksu.edu.sa/sites/default/files/syllabusmath425_0.pdf
Other Learning Materials	Software package as Maple software or MATLAB

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, Maple and MATLAB software
Other equipment (Depending on the nature of the specialty)	Wi-Fi internet connections

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

قسم الرياضيات والإحصاء
Mathematics and Statistics
Department

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