هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد NCAAA T4 2020

Course Specifications

Course Title:	INTRODUCTION TO PARTIAL DIFFERENTIAL EQUATIONS
Course Code:	**MATH 4360**
Program:	**BACHELOR OF SCIENCE IN MATHEMATICS**
Department:	**MATHEMATICS**
College:	**COLLEGE OF SCIENCE AND HUMANITIES STUDIES**
Institution:	**PRINCE SATTAM BIN ABDULAZIZ UNIVERSITY**

Table of Contents

A. Course Identification

1. Credit hours: 4
2. Course type **a.** University ☐ College ☐ Department ☑ Others ☐ **b.** Required ☑ Elective ☐
3. Level/year at which this course is offered: Level 11
4. Pre-requisites for this course (if any)**:** **Math 3320, Math 3330**
5. Co-requisites for this course (if any)**:** **None**

6. Mode of Instruction (mark all that apply)

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

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	**48**
2	**Laboratory/Studio**	
3	**Tutorial**	**00**
4	**Others** (specify) - Office Hours (14 X 5)	60
	Total	**108**

B. Course Objectives and Learning Outcomes

1. Course Description

Introduction and Basic Facts about PDE's – Types of PDE's – Derivation of the Heat and Wave Equations from physics – Solution of boundary problems (Dirichlet, Newmann, Robin) by Fourier series – Eigenvalues – EigenFunctions – Orthogonality of EigenFunctions – Sturm–Liouville Problem – Separation of Variables: The Heat Equation in 1D – The Wave Equation in 1D.
Laplace's Equation in Rectangles, Circles - Inhomogeneous PDEs and the (Generalized) Fourier series – Fourier Transform – Solutions of PDE's by Fourier Transform – Heat and Wave Equations in Half Space – Solving Simple Equations by Characteristics.

2. Course Main Objective

The Objective is to make the students understand the concept Partial Differential Equations and its types, formation and finding solutions of various types of PDEs and its applications.

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Be familiar with the concept of formation of Partial Differential Equations	K1
1.2	Able to recognize the different types of PDE – homogeneous and non-homogeneous	K3
1.3	Describe appropriate method to solve PDEs	K4
2	**Skills :**	
2.1	Gain skill to solve PDEs using various techniques such as separation of variables, Monge Method and Fourier Transform Method	S1
2.3	Able to solve problems of Heat and Wave equations in Halfspace	S2

C. Course Content

No	List of Topics	Contact Hours
1	Introduction – PDEs – Formation and Types	4
2	Derivation of Heat and Wave Equations	4
3	Solution of Boundary Problems by Fourier Series	4
4	Eigen Values and Eigen Functions, Orthogonality	6
5	Sturm – Liouville Problem	4
6	Separation of Variables	4
7	Heat and Wave Equations in 1D	4
8	Laplace Equations	6
9	In Homogeneous PDEs and Fourier Series	3
10	Fourier Transform and Solution of PDES	3
11	Heat and Wave Equations in Half Space	3
12	Solving Simple equations by characteristics	3
...		
Total		48

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	Be familiar with the concept of formation of Partial Differential Equations	1.Class Room Lectures 2. Interactive sessions 3. Exclusive Office Hours for clearing doubts in small groups	1. Two Internal Exams 2. At least two Quiz 3. End Semester Exam
1.2	Able to recognize the different types of PDE – homogeneous and non-homogeneous		
2.0	**Skills**		
2.1	Gain skill to solve PDEs using various techniques such as separation of variables,		1. Home works

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
	Monge Method and Fourier Transform Method	Application oriented exercises during tutorial session. Homework to improve the analytical skills	2. Assignments 3. Quizzes
2.3	Able to solve problems of Heat and Wave equations in Halfspace		

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Mid Term Exam I	**6**	**20%**
2	Quiz	**4 & 10**	**5%**
3	Mid Term Exam II	**13**	**20%**
4	Continuous Assessment – Homework, Assignment, Attendance etc.	**--**	**5%**
5	End Semester Exam (Practical 10%, Theory 40%)	**15**	**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 :

1. Exclusive Office Hours – 5 Hours per week
2. Academic Advising for Students – Hour per week

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	• Elementary applied Partial Differential Equations, Richard Haberman, ISBN0– 13– 252875– 4. • Partial Differential Equations with Fourier Series and Boundary value Problems, Nakhale Asmar • -An introduction to partial differential equations, Yehuda Pinchover and Jacob Rubinstein
Essential References Materials	NIL
Electronic Materials	Paul's Online Series
Other Learning Materials	Lecture Notes Prepared by the Department of Mathematics

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms with Smart boards with seating facilities for at least 30 students
Technology Resources (AV, data show, Smart Board, software, etc.)	Smartboard, Internet Connection for Blackboard
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	Library

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of Teaching	Students, Graduates	Course Evaluation and Program Evaluation Survey (Indirect)
	Program Leaders	Peer Review (Direct)
Achievement of CLOs	Faculty and Quality Personnel	Direct (Tests and Quiz) and Review of Course Report
Quality of Learning Resources	Students	Course Evaluation (Indirect)
	Graduates	Program Evaluation(Indirect)
Facilities	Students / Graduates	Course and Program Evaluation (Indirect)
	Faculty	Faculty Survey (Indirect), Course Reports (Direct)

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	
Reference No.	
Date	