Estd 1864

Forman Christian College, Lahore
(A Chartered University)
Department of Mathematics

Instructor's Information:

Name: Dr. Ahmad Mahmood Qureshi
(Associate Professor & Dean Faculty of Computer and Mathematical Sciences)

Office: S - 204

Office Hours: Tuesday and Thursday (12:30 PM to 02:00 PM)
OTHERWISE GET APPOINTMENT FIRST.

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Course Information:

Course Code: MATH 404 **Title:** Partial Differential Equations **Credits:** 4

Prerequisite: MATH 202: Ordinary Differential Equations

Class Room: S 412

Lecture Time: M W (02:00 PM – 03:40 PM)

Text Books:

1. Nakhlé H. Asmar, *Partial Differential Equations with Fourier Series and Boundary Value Problems*, 2nd edition.
2. Myint-U, Debnath, *Linear Partial Differential Equations for Scientists and Engineers*, 4th edition.
3. Dennis G. Zill and Warren S Wright, *Differential Equations with Boundary Value Problems*, 8th edition.
4. I. N. Sneddon, *Elements of Partial Differential Equations*, International Student Edition (McGraw-Hill International Book Company).

Course Objectives:

The purpose of this course is to:

1. provide a basic understanding of the common solution techniques for several types of partial differential equations (PDEs).
2. introduce and comprehend the use of Integral Transforms (such as Laplace and Fourier transforms) to solve PDEs.
3. have active participation of students in class through practice sessions of exercises and problems whereby students comprehend the concepts and techniques of solving PDEs.
4. prepare students for advanced courses in Applied Mathematics.

Learning Outcomes:

After successfully completing this course, the students would be able to:

1. demonstrate a good understanding of several types of partial differential equations and their solutions.
2. develop techniques for solving partial differential equations.
3. suitably prepare themselves for higher level courses in applications of partial differential equations and Applied and Computational Mathematics.

Course Requirements:

Students are expected to attend every class. **I will follow the university's attendance policy** as indicated in *Baccalaureate Student Handbook* **especially** the rule that **student whose attendance is less than 70% won't be allowed to take the final exam.**

Students must arrive at class on time and **those coming after attendance call won't be marked present. Inside the classroom Mobile phones will remain switched off** and **no one will sleep.**

Working regularly, understanding the lectures, doing assignments will be very helpful in quizzes, mid-term and final to get a good grade. **Your comprehension of concepts and ability to apply and analyze ideas will be reflected in your grades.**

These steps have been taken to maintain discipline and making course understandable but not to put pressure on the students and to **avoid** using the illegal ways like **cheating** to pass the exams.

From *Baccalaureate Student Handbook* following are the **consequences** for **cheating**:

First offence: a grade of zero will be assigned to the paper, report, quiz or test. The student's final grade for the class must be reduced by *at least* one letter grade.

Second offence: an automatic dismissal from the course in which the second offence occurred with a resulting final grade of "F".

Third offence: the student will be called before an Academic Review Board to show cause why the College should not suspend him or her. The Vice-Rector will convene such a hearing.

Quizzes/Exams Distribution: Quizzes/Exams will be distributed in the class but if anyone is going to be absent then he/she should get quizzes from the class representative. Quizzes/Exams will be **discussed** within **first three days only** (after the quiz/exam).

Course Evaluation:

Grading will be based on following criteria:

Class participation and behavior	5%
Assignment/Presentation	10%
Quizzes (4 and **best 3** will be counted)	15%
Mid Term	30%
Final Exam	40%

Grades	Quality Points	Numerical Value	Meaning
A	4.00	93-100	Superior
A-	3.70	90-92	
B+	3.30	87-89	
B	3.00	83-86	Good
B-	2.70	80-82	
C+	2.30	77-79	
C	2.00	73-76	Satisfactory
C-	1.70	70-72	
D+	1.30	67-69	
D	1.00	60-66	Passing
F	0.00	59 or below	Failing

Course Outline:

Week	Topics
1	1) Discussion of Course Plan 2) Partial Differential Equations (PDEs): Introduction
2	1) Origins of Partial Differential Equation 2) Formation of PDEs
3	1) **QUIZ-1** 2) Lagrange's Equation
4	1) Integral Surfaces Passing through a Given Curve 2) Surfaces orthogonal to a given system of surfaces
5	1) **QUIZ-2** 2) PDEs of the second order
6	1) Linear PDEs with constant coefficients 2) Classification and Characteristics of 2^{nd} order PDEs
7	1) Reduction to Canonical (or Normal) Forms 2) Related Problems

8	**MID-TERM** **Mid-Term Course: Topics covered** in **first 7 Weeks Lectures** 1) Solution of PDEs by method of Separation of Variables
9	1) Boundary Value Problems 2) Classical Equations: Heat Equation, Wave Equation, Laplace's Equation.
10	1) **QUIZ-3** 2) The Method of Integral Transforms
11	1) Introduction and properties of Laplace Transform 2) Laplace Transform of Partial Derivatives
12	1) Inverse Laplace Transform 2) Solution of PDEs by Laplace Transform
13	1) **QUIZ-4** 2) Introduction to Fourier Transform, transform of elementary functions 3) Fourier sine and cosine transform
14	1) Inverse Fourier Transform 2) Solution of PDEs by Fourier Transforms
15	1) Solution of PDEs by Fourier sine Transform 2) Solution of PDEs by Fourier cosine Transform