EAST WEST UNIVERSITY

Department of Mathematical and Physical Sciences

Course Outline

Semester: Fall 2024

Course Title	**:** Differential Equations and Special Functions
Course Code	**:** MAT102
Pre-Requisite	**:** MAT101
Credit Hour	**:** 3
Course Instructor	**:** Prof. Dr. M. Mustafizur Rahman
Office Room	**:** Room# FUB 1004
E-mail Address	**:** mustafizur.rahman@ewubd.edu
Textbook	**:** (a) A First Course in Differential Equations with Modeling Applications, 10th Edition, Dennis G. Zill, Gary Ostedt. (b) Elementary Differential Equations (Fourth Edition): Earl D. Rainville& Phillip E. Bedient.
Reference Books	**:** (a) Differential Equations: S. L. Ross. (b) Advanced Engineering Mathematics: H.K. Dass. (c) Ordinary and Partial Differential Equations: M. D. Raisinghania.
Class Hours	**:**

Section	Days	Time	Room
12, 13	MW	01.40-2.55 and 04:30-5:45	FUB 603 and FUB 801

Course Goal

For the students of any branch of science, knowledge of Mathematics is essential.
The course titled "Differential Equations and Special Functions" helps the students develop the basic concept on differential equations and special functions. All the physical phenomena are modeled by differential equations and the solutions of the differential equations come in the form of special functions. Our goal is to obtain basic knowledge about differential equations and special functions.

Course Learning Outcomes

The specific course outcomes supporting the programs outcomes are: At the end of this course, students should be able to:
Outcome 1

- Identify, examine, and subsequently solve physical situations whose behavior can be described by ordinary differential equations.

Outcome 2

- Identify, explore, and subsequently solve physical situations whose behavior can be described by partial differential equations.

Outcome 3

- Identify, investigate, and subsequently solve physical situations whose behavior can be described by Special Functions.

Course Contents:

1. Ordinary Differential Equations

2. Partial Differential Equations and

3. Special Functions

Description: The following topics will be covered throughout the semester.

Ordinary Differential Equations

1. Degree and order of ordinary differential equations, Formation of differential equations.

2. First order differential equations: Variable separable, Homogeneous differential equations, linear differential equations, and Equations reducible to linear differential equations (Bernoulli's equations), exact differential equations.

3. Linear differential equations of second or higher order with constant coefficients:

(i) Homogeneous equations: Initial and boundary value problems, (ii) Nonhomogeneous equations: Method of undetermined coefficients, Variation of parameters.

4. Series solution: Frobenius method.

Partial Differential Equations

1. Derivations of Partial differential equations by eliminating arbitrary constants.

2. Solutions of first order partial differential equations: Lagrange's method.

3. Second order homogeneous and non-homogeneous equations with constant coefficients.

4. Wave equations.

Special Functions

1. Legendre differential equation and Legendre polynomials, Recurrence relations

for Legendre polynomials, Spherical Harmonics.

2. Bessel's differential equations, Bessel functions, Recurrence relations for Bessel functions.

3. Hermite Differential equation, Hermite polynomials, Recurrence relations for Hermite polynomials.

Assessment Tools

Assessment tools include **Class Tests** (**Short Quizzes), Assignments, Presentations/Viva, and Exams**. The Class Tests are about 10-15 minutes in class and the Mid Term Exam and Final Exam are 80 minutes duration in class. Class Test dates will be announced in the Class and the Exam dates are as follows:

Mid Term Exam Date	**Wednesday**	**18-12-2024**
Final Exam Date	**Wednesday**	**12-2-2025**

Assessment/Evaluation/Grading Policy

The relative contributions of class tests, presentations and exams are as follows:

Test/Exam	% of Marks
Class Tests	20
Assignments	5
Presentation/Viva	5
Mid Term Exam	30
Final Exam	40

The University Grading Scheme is the following:

Range of Marks (%)	**Letter Grade**	**Grade Point**	**Range of Marks (%)**	**Letter Grade**	**Grade Point**	**Range of Marks (%)**	**Letter Grade**	**Grade Point**
80 – 100	**A+**	**4.00**	**65 – 69**	**B+**	**3.25**	**50 – 54**	**C+**	**2.50**
75 – 79	**A**	**3.75**	**60 – 64**	**B**	**3.00**	**45 – 49**	**C**	**2.25**
70 – 74	**A-**	**3.50**	**55 – 59**	**B-**	**2.75**	**40 – 44**	**D**	**2.00**
						Less than 40	**F**	**0.00**

Special Instructions:

- **No make-up quizzes** will be held.
- Students are requested to **switch off their mobile telephone** during the class hour.
- **There is zero tolerance for cheating at EWU. Students caught with cheat sheets in their possession, whether used or not used, &/or copying from cheat sheets, writings on the palm of hand, back of calculators, chairs or nearby walls, etc. would be treated as cheating in the exam hall. The only penalty for cheating is expulsion from EWU.**

Dr. Md. Mustafizur Rahman

Date: 21-10-2024