EAST WEST UNIVERSITY

Department of Mathematics and Physical Sciences (MPS)
Semester: Summer 2023
Faculty: DSBK

Course Outline of MAT102

Course Title : Differential Equations and Special Functions
Course Code : MAT102
Pre-Requisite : MAT101
Credit Hours : 3
Course Instructor : **Prof. Dr. Sidhartha Bhowmick**, Adjunct Faculty, Department of MPS
Office Room : Adjunct Faculty Room
Email Address : sidhartha.bhowmick@ewubd.edu
Mobile : 01718 117897
Class Hours :

Section	Days	Time	Room
7	TR	08:30 AM – 10:00 AM	R#FUB-504
8	TR	10:10 AM – 11:40 AM	R#FUB-504

Office Hours :

S	M	T	W	R
		11:45 AM – 01:30 PM		11:45 AM – 02:00 PM

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 phenomenon 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. The goal of this course is to introduce the fundamental ideas of the differential equations and special functions to the students.

Learning Outcomes:

On successful completion of the course, the students will be able to:

- Identify, analyze and subsequently solve physical situations whose behavior can be described by ordinary differential equations;
- Find general solutions to first-order, second-order, and higher-order homogeneous and non-homogeneous differential equations by various methods;
- Identify and apply initial and boundary values to find particular solutions to first-order, second-order, and higher order homogeneous and non-homogeneous differential equations by various methods, and analyze and interpret the results;

- Select and apply appropriate methods to solve differential equations;
- Select and apply series techniques to solve differential equations;
- Solve the integrals involving Bessel Functions;
- Solve the integrals involving Legendre Functions;
- Solve the integrals involving Hermite 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) Non-Homogeneous 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.

Text book :

(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. Das.

(c) Ordinary and Partial Differential Equations: M. D. Raisinghania.

Term Examinations:

Examinations	Day	Date
Midterm-I	Thursday	13.07.2023
Midterm-II	Thursday	10.08.2023
Last day of class	Thursday	07.09.2023
Final	Tuesday	12.09.2023

Score Distribution:

Quiz	Assignment/Project	Attendance	Presentation	Class Performance
10%	10%	5%	5%	5%

Term 1	Term 2	Final
20%	20%	25%

Grading Policy:

Marks (%)	Letter Grade	Grade Point
97-100	A+	4.00
90 - 96	A	4.00
87 - 89	A-	3.70
83 - 86	B+	3.30
80 - 82	B	3.00
77 - 79	B-	2.70
73 - 76	C+	2.30
70 - 72	C	2.00
67 - 69	C-	1.70
63 - 66	D+	1.30
60 - 62	D	1.00
below 60	F	0.00

Special Instructions:

- Students are not allowed to enter into the classroom after 5 minutes of starting time.
- No make-up quizzes and assignments will be held.
- Students are requested to switch off their mobile during the class hour.
- ***There is zero tolerance for cheating at EWU. Students caught with cheat sheet 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.***

Professor Dr. Sidhartha Bhowmick
Date: June 04, 2023