North South University
Department of Mathematics and Physics

MAT260: Differential Equations & Orthogonal Functions

Course Name: Differential Equations & Orthogonal Functions
Course Code: MAT 260
Credit Hours : 3 Credits
Pre-requisite : MAT 130
Semester : **Fall 2017**

Course Short Description:
This course is intended for Civil engineering students who require a working knowledge of differential equations; included are techniques and applications of ordinary differential equations and an introduction to partial differential equations, as well as the power series and some important orthogonal functions.

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Course Learning Outcomes:

Upon successful completion of this course, students will be able to:

(a) Classify the type of a given differential equation and select and apply the appropriate analytical technique for finding the solution of first order differential equations.
(b) Create and analyze mathematical models using first order ordinary differential equations.
(c) Identify the type of selected higher order ordinary differential equations and solve those using different methods.
(d) Apply and analyze mathematical models using second order ordinary differential equations.
(e) Find the power series solutions of order ordinary differential equations about ordinary points.
(f) Interpret functions of several variables with their essential properties.
(g) Develop the ability to apply Fourier series and Fourier Integrals to significant applied problems.
(h) Demonstrate partial derivatives and multiple integrals for functions of several variables.
(i) Identify orthogonal functions and derive solution of classical partial differential equations (PDEs).

Course Outline:

1. **First Order Ordinary Differential Equations:**
Introduction to Ordinary Differential Equations (ODEs), mathematical modeling with ODEs, Separable ODE, Linear ODE

2. **Second Order ODEs:**
Homogeneous Linear ODEs of Second Order, Homogeneous Linear ODEs with Constant Coefficients, Euler–Cauchy Equations, Existence and Uniqueness of Solutions. Wronskian, Non-homogeneous ODEs, Homogeneous Linear ODEs, Linear independence, Wornskian.Homogeneous Linear ODEs with Constant Coefficients, Non homogeneous Linear ODEs. Modeling and Applications.

3. **Series Solutions of ODEs**
Infinite Series, Maclaurin and Taylor Series, Power series method, Extended Power Series Method, Method of Frobenius, Bessel's Equation. Bessel Functions and general solution.

4. **Partial Differential Equations (PDEs)**
Functions of several variables, Limits, Continuity, Differentiability. Multiple Integrals. Orthogonal Functions, Fourier Series, Derivation and Solution of Classical PDEs

Marks Distribution:

Attendance-	5%
Regular Quizzes (3 quizzes)	15%
Two Mid-Terms-	40%
Final Exam-	30%
Assignment/Class performance/	10%
Total	**100%**

Text Books:

1. A First Course in Differential Equations with Modeling and Applications, (10th Edition), Author-Dennis G. Zill.

2. Calculus (9^{th} Edition), Howard Anton and others

3. Advanced Engineering Mathematics (10^{th} Edition)- Author: Erwin Kreyszig

Grading Policies: As per NSU Grading Policy

Important dates:

First midterm TBA
Second midterm **TBA**
Course Final TBA

Rules and Restrictions:

(a) Submit the assignments in recommended date. **No late submission will be accepted**. Make a photocopy of your assignment before submission.
(b) There is **no scope to retake a quiz**. In case of Mid-term- or Final exam, exceptional cases*(unfortunate physical inability, accidents, serious illness) may be considered conditionally (with a **penalty of 20% reduced marks**) with proper justification.
(c) A late present means you come to the class within 10 minutes the class starts. You are automatically **absent after 10 minutes delay** and not allowed in the class.
(d) Three consecutive absents need an official clarification.
(e) Student having attendance **less than 50% of total classes will be not allowed to sit for Final Exam**.
(f) If you are a **probation student/retake**, I would like to have you in 24 classes (**20 present is Must)**

********** **Thank You** **********