MATH 204 Differential Equations (Semester I-1439/40)

4 credit-hours.

Prerequisite: 201M or 203M: *Language of instruction: English*

Various types of first order differential equations and their applications. Linear equations of higher order. Systems of linear equations with constant coefficients, Power series methods for solving second order equations with polynomial coefficients. Fourier series, Fourier series for even and odd functions. Complex Fourier series, Fourier integral.

References:

1. Differential equations with boundary value problems: by Dennis G. Zill and Michael R Cullen (Seventh or sixth edition).

2. Differential Equations by Prof. Dr. Said Mesloub, Prof. Dr. Damlakhi   Mostafa, and Dr. Khawaja Zafar Elahi

Weekly Course Details

1. Definition of a Differential equation, Classification of Differential equations by (type, order, linearity), Interval of definition, types of solutions (explicit form, implicit form).

2. Initial value problems. Existence and uniqueness theorem, Separable equations (Separable variables).

3.Equations with homogeneous coefficients, Solutions by substitution

4.: Exact Equations, Integrating factor.

5. Bernoulli equation, Equations with linear coefficients

6. Applications: Orthogonal trajectories, Growth and decay, Newton's Law of Cooling/Warming.

7. Higher order Differential equations. Linear Differential equations: Existence-Uniqueness theorem, Linearly (independent solutions, dependent solutions), Wronskian. Reduction of order.

8. Homogeneous linear Differential equations with constant coefficients. Undetermined coefficient method, Superposition principle.

9. Variation of parameters, Cauchy-Euler Equation.

10. Solving systems of Linear Equations by Elimination.

11. Series solutions of Linear Equations.

12. Orthogonal Functions and Fourier Series.

13. Fourier cosine and sine series, Complex Fourier Series.

14. Fourier Integral.

15. Revision.

Midterm Exam I:
Midterm Exam II:
Final Exam: