



Department of Mathematics
Faculty of Sciences, Jamia Millia Islamia

B. Sc. (Hons.) Mathematics
Course Structure and Syllabus (w. e. f. 2024-25)

Semester – II			
Category	Code	Title of Paper	Credits
Major	24MATC151	Differential Equations	4
Major	24MATC152	Probability and Statistics	4
Total Credits			8

24MATC151 Differential Equations

Unit-I	Method of separation of variables, Linear equations, Bernoulli equations, Exact differential equations, Integrating factors, Homogeneous equations. Equations of the first order and higher degree, Equations solvable for p, y and x , Clairaut's & Lagrange's equations.
Unit-II	Linear differential equations of 2 nd order with constant coefficient, Method of auxiliary equation, Complementary function and particular integral. Operator method for finding particular integral for functions of the form e^x , $\sin ax$, $\cos ax$, x^m and $e^{\alpha x}V(x)$, Euler-Cauchy equations.
Unit-III	Linear differential equations of second order, Complete solution in terms of a known integral belonging to the complementary function, Normal form (removal of the first derivative), Simultaneous equations with constant coefficients, Simultaneous equations of form $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$
Unit-IV	Systems of linear differential equations, types of linear systems, differential operators, an operator method for linear systems with constant coefficients, Basic Theory of linear systems in normal form, homogeneous linear systems with constant coefficients.

Books Recommended

1. Dennis G. Zill: *A First Course in Differential Equations with Modelling Applications*, Cengage Learning; 11th Edition, 2019.
2. G.F. Simmons: *Differential Equations with Applications and Historical Notes*, 3rd edition, CRC press, Taylor & Francis, 2017.
3. S. L. Ross: *Differential equations*, John Wiley and Sons, 2004.
4. Zafar Ahsan: *Textbook of Differential Equations and their Applications*, 2nd Edition, Prentice Hall of India, 2012.
5. Khalil Ahmad: *Textbook of Differential Equations*, World Education Publishers, 2012.

24MATC152 Probability and Statistics

Unit-I	Probability: Basic concepts and definitions, conditional probability, basic laws of total probability, Bayes' theorem, Discrete and continuous random variables, Probability mass/density functions, Cumulative distribution function, Mathematical expectation, Moments, Moment generating function, Characteristic function.
Unit-II	Discrete distributions: Uniform, Bernoulli, Binomial, Negative binomial, Geometric and Poisson; Continuous distributions: Uniform, Gamma, Exponential, Chi-square, Beta and normal; Normal approximation to the binomial distribution.
Unit-III	Two-dimensional random variables, Joint probability density function, joint distribution functions, marginal distributions, Expectation of function of two random variables, Joint moment generating function, Conditional distributions and expectations.
Unit-IV	Covariance, the Correlation coefficient, Linear regression for two variables, Method of least squares, least square method of fitting regression lines, Strong law of large numbers, Central limit theorem and weak law of large numbers.

Books Recommended

1. Irwin Miller and Marylees Miller, *John E. Freund's: Mathematical Statistics with Applications*, Pearson Education, 2012
2. Robert V. Hogg, Allen Craig Deceased and Joseph W. McKean: *Introduction to Mathematical Statistics*, Pearson Education, 2012.
3. Sheldon M. Ross: *Introduction to Probability and Statistics for Engineers and Scientists*, Elsevier Academic Press, 2009.
4. S.C. Gupta and V. K. Kapoor: *Fundamentals of Mathematical Statistics*, S. Chand.