INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPARTMENT/CENTRE: Department of Mathematics

Subject Code: MAC-501 **Course Title:** Probability and Statistics

L-T-P: 3-0-2 **Credits:** 4 **Subject Area:** PCC

Course Outlines: Random variables and their distributions, special distributions: binomial, Poisson, negative binomial, geometric, hypergeometric, uniform, exponential, gamma, beta, Weibull, normal, lognormal; bivariate random variables, correlation, regression, functions of random variables, convergence of random variables, law of large numbers, central limit theorem, sampling distributions, point estimation, interval estimation, testing of hypothesis: type I and II errors, Neyman-Pearson lemma, uniformly most powerful tests, tests for one sample and two sample problems for normal populations, tests for proportions.

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPARTMENT/CENTRE: Department of Mathematics

Subject Code: MAC-502 **Course Title**: Complex Analysis

L-T-P: 3-1-0 **Credits:** 4 **Subject Area:** PCC

Course Outlines: Functions of one complex variable; Holomorphic functions, Harmonic functions; Complex Integration; Residue Calculus; Conformal Mappings and applications

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPARTMENT/CENTRE: Department of Mathematics

Subject Code: MAC 503 **Course Title**: Ordinary Differential Equations

L-T-P: 3-1-0 **Credits:** 4 **Subject Area:** PCC

Course Outlines: Well-posedness of first-order differential equations and systems, linear systems and their properties, power series solutions, oscillation theory, boundary value problems for second-order differential equations and Green's functions, Sturm-Liouville problem, autonomous systems and phase-plane analysis, stability of linear and non-linear systems.

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPARTMENT/CENTRE: Department of Mathematics

Subject Code: MAC 504 **Course Title**: Partial Differential Equations

L-T-P: 3-1-0 **Credits:** 4 **Subject Area:** PCC

Course Outlines: Surfaces and curves, Pfaffian differential equations, first-order quasi-linear PDE, method of characteristics, non-linear PDEs of the first order, Charpit's method, Classification and canonical forms of second-order PDEs, characteristic curves for second order PDEs, Laplace and Poisson equations, solution by Fourier series, Green's functions, Wave equation, Fourier series and transform methods, Diffusion equation, Duhamel's principle.

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPARTMENT/CENTRE: Department of Mathematics

Subject Code: MAC-511 **Course Title**: Numerical Analysis

L-T-P: 3-0-2 **Credits:** 4 **Subject Area:** PCC

Course Outlines: Method of inflation, Jacobi, Givens and Householder methods for symmetric matrices, LR and QR methods, multistep methods for initial value problems, error and stability analysis, Stiff Problems and Boundary Value Problems, finite difference methods, numerical methods for solving elliptic, parabolic and hyperbolic PDEs with error, convergence and stability analysis.

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPARTMENT/CENTRE: Department of Mathematics

Subject Code: MAC-513 **Course Title**: Operations Research

L-T-P: 3-0-2 **Credits:** 4 **Subject Area:** PCC

Course Outlines: Basics of linear programming problems, simplex and Big-M method, revised simplex method, duality theory, sensitivity analysis, parametric LPP, cutting plane and branch-and-bound techniques for all integer and mixed integer LPPs, transportation problems, game theory, Steady-state solutions of Markovian queuing models, inventory models.