TEERTHANKER MAHAVEER UNIVERSITY

(Established under Govt. of U. P. Act No. 30, 2008)
Delhi Road, Moradabad (U.P.)

PhD PROGRAMME

SYLLABUS FOR DISCIPLINE-SPECIFIC COURSE MATHEMATICS

Course Code: PDS240128	Advances in Mathematics	L	T	P	C
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Objective:	To familiarize the research scholar with the fundamentals of scientific research.				
Course Outcomes:	On completion of the course, the students will be able to:				
CO 1:	Apply the concept of differential equations.				
CO 2:	Analy the concept of analytic function and its applications.				
CO 3:	Apply the concepts of graph theory on real life problems.				
CO 4:	Analyze the concepts of operations research on realistic problems.				
CO 5:	Evaluate the numerical solutions of differential equations, numerical integration.				
Course Content:					
Unit 1:	Differential Equations: Linear differential equations with constant coefficients; Initial value problems for second order equations; Second order homogeneous differential equation; Linear equations with variable coefficients: Variation of parameters, Simultaneous linear differential equation.				
Unit 2:	Complex Analysis: Analytic function, conjugate function, Harmonic function, Cauchy Riemann equation, construct of analytic function by Milne-Thomson method. Complex Integration: Complex line integral, Cauchy's integral theorem, Cauchy's integral formula for derivatives of analytic functions.				
Unit 3:	Graph Theory: Graph, Applications of Graph, Finite and Infinite Graphs, Null Graph, Incidence and Degree, Isolated Vertex, Pendant Vertex, Isomorphism, Sub graphs, Walks, Paths, Circuits, Connected Graphs, Disconnected Graphs and Components. Euler's Graph, Operations on Graphs, Hamiltonian Paths and Circuits, Shortest Path Algorithms, The Traveling Salesman Problem.				
Unit 4:	Operation Research: Introduction of Operation Research, formulation of OR models, Linear programming problem; Simplex method, Two-phase and Big-M methods, Duality.				
Unit 5:	Numerical Methods: Numerical integration: Trapezoidal rule; Simpson's 1/3 rule, Simpson's 3/8 rule. Numerical solution of ordinary differential equations: Picard's successive approximations, Runge-Kutta; Simultaneous and higher order equations: Runge-Kutta method.				

Textbooks:	1. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice-Hall of India. 2. Shanti Narayan, Complex Variable, S. Chand & Company. 3. Narsingh Deo; Graph Theory; Prentice-Hall, Inc 4. S. D. Sharma Operation Research, KedarNath Ram Nath. 5. Grewal B. S, Numerical Methods in Engineering and Science, Khanna Publishers.
Reference Books:	1. G. Birkhoff and G.C. Rota, Ordinary differential equations, John Wiley and Sons. 2. S. G. Deo, V. Lakshmi Kantham, V. Raghvendra, Text book of ordinary Differential Equations, Tata Mc-Graw Hill. 3. L. V. Alfors, Complex Variable, Mc-Graw Hill & Co. 4. J.A. Bondy U.S.R. Murty; Graph Theory, Springer 5. R. L. Ackoff and N.W. Sasieni, Fundamental of Operations Research, John Willy. 6. M.K. Jain, S. R. K Iyengar & R. K. Jain, Numerical methods of Scientific and Engineering Computation, New Age Pub *Latest editions of all the suggested books are recommended.
Additional Electronic Reference Material:	1. https://youtu.be/ES741wq3APA 2. https://youtu.be/Mwpz1zjPlzI 3. https://youtu.be/fZD9vXz5dSU 4. https://youtu.be/vv8Sk4zZ6Hw 5. https://youtu.be/TWAN_T66Cps