

U.G. 4th SEMESTER SYLLABUS
DEPARTMENT OF EDUCATION
COTTON UNIVERSITY

PAPER : MTH401C

DIFFERENTIAL EQUATIONS - II

(Credits: 4+1+0=5)

(64 lectures)

Unit- I

Second order equations with regular singular points. Series solutions of differential equations about ordinary and singular points. Bessel and Legendre differential equations. Bessel functions, Legendre polynomials and their properties. (16 lectures)

Unit- II

Introduction to partial differential equations, classification, construction and geometrical interpretation of first order partial differential equations (PDE), canonical form of first order PDE, method of separation of variables for first order PDE, method of characteristic and general solution of first order PDE. Determination of integral surfaces of linear first order partial differential equations passing through a given curve; surfaces orthogonal to given system of surfaces. (18 lectures)

Unit- III

Non-linear PDE of first order, Cauchy's method of characteristic; compatible system of first order PDE; Charpit's method of solution, solutions satisfying given conditions, Jacobi's method of solution.

(16 lectures)

Unit- IV

Origin of second order PDE, classification of second order PDE, one dimensional wave and heat conduction equations, gravitational potential, linear second order PDE with constant coefficients. (14 lectures)

Books Recommended:

1. T. Myint-U and L. Debnath, Linear Partial Differential Equation for Scientists and Engineers, Springer, Indian reprint, 2006.
2. I. N. Sneddon, Elements of Partial Differential Equation (3rd edition), McGraw Hill Book Company, 1998.

Books for Reference:

1. I. P Stavroulakis and Stepan A Tersian, Partial Differential Equations: An Introduction with Mathematica and MAPLE, World Scientific, Second Edition, 2004.

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2. G. Simmons, Differentials Equations with Applications and Historical Notes 2nd Edition, Mcgraw Higher Ed, 1991.
3. R. Bronson, Gabriel Costa, Differential Equations 3rd Edition, Schaum's Outline, 2009.
4. K. Sankara Rao, Introduction to Partial Differential Equations, PHI; 3rd edition edition, 2010

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ANALYSIS - III

(Credits: 4+1+0=5)

(64 lectures)

Unit-I

Riemann integration; inequalities of upper and lower sums; Riemann conditions of integrability. Riemann sum and definition of Riemann integral through Riemann sums; equivalence of two definitions; Riemann integrability of monotone and continuous functions, properties of the Riemann integral; definition and integrability of piecewise continuous and monotone functions. Intermediate value theorem for integrals; fundamental theorems of calculus. (20 lectures)

Unit-II

Improper integrals: Convergence of improper integrals. Beta and Gamma functions and their properties. Differentiation under the sign of integration, Frullani's integrals. (12 lectures)

Unit-III

Pointwise and uniform convergence of sequence of functions. Theorems on continuity, derivability and integrability of the limit function of a sequence of functions. (11 lectures)

Unit-IV

Series of functions; Theorems on the continuity and derivability of the sum function of a series of functions; Cauchy criterion for uniform convergence and Weierstrass M-Test. (09 lectures)

Unit-V

Limit superior and Limit inferior. Power series, radius of convergence, Cauchy Hadamard theorem, differentiation and integration of power series; Abel's theorem; Weierstrass approximation theorem.

(12 lectures)

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Books Recommended:

1. K.A. Ross, Elementary Analysis: The Theory of Calculus, Undergraduate Texts in Mathematics, Springer (SIE), Indian reprint, 2004.
2. R.G. Bartle D.R. Sherbert, Introduction to Real Analysis (3rd edition), John Wiley and Sons (Asia) Pvt. Ltd., Singapore, 2002.

Books for Reference:

1. G. Das and S. Pattanayak, Fundamentals of Mathematics Analysis, McGraw Hill Education; 1st Edition, 2007.
2. Charles G. Denlinger, Elements of Real Analysis, Jones and Bartlett (Student Edition), 2011.

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ABSTRACT ALGEBRA - II

(Credits: 4+1+0=5)

(64 lectures)

Unit I

Definitions, examples and properties of rings, subrings, ideals, fields, integral domains, division rings, characteristic of a ring, sum of ideals, product of ideals (15 lectures)

Unit II

Homomorphisms of rings and imbeddings: maximal and prime ideals, idempotent & nilpotent elements and ideals, nil ideals in a ring, principal ideal, simple ring. (15 lectures)

Unit III

Principal ideal domain, unique factorization domain and Euclidean domain, quotient rings, field of quotients of an integral domain. (12 lectures)

Unit IV

Polynomial rings, its ideals and quotients, ring of matrices-its ideals and quotients. (10 lectures)

Unit V

Factorization of polynomials, reducibility tests, irreducibility tests, Eisenstein criterion, unique factorization in $Z[x]$. Divisibility in integral domains, irreducibles, primes. (12 lectures)

Books Recommended:

1. P. B. Bhattacharya, S. K. Jain, S. R. Nagpaul, Basic Abstract Algebra, Cambridge University Press, 2nd Edition, 1994.

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2. J. A. Gallian, Contemporary Abstract Algebra (4th Edition), Narosa Publishing House, New Delhi, 1999.(IX Edition 2010)

Books for Reference:

1. I. N. Herstein, Topics in Algebra , New Age Publications, 2006.
2. D.S. Malik, John M. Mordeson and M.K. Sen, Fundamentals of abstract algebra, McGraw-Hill, 1997
3. J. B.Fraleigh, A first course in Abstract Algebra, 7th Edition, Pearson Education India, 2003
