

Teacher's Name: Dr. Subodh Kumar

Course: B. Sc. (H) Mathematics

Semester: V

Paper: DSC-14: Ring Theory

Weeks 1 and 2: Definition and examples of rings, Properties of rings, Subrings. [1]: Chapter 12.

Week 3 and 4: Integral domains and fields, Characteristic of a ring. [1]: Chapter 13.

Weeks 5 and 6: Ideals, operations on ideals, ideal generated by a set and properties, Factor rings, Prime and maximal ideals, Principal ideal domains. [1]: Chapter 14.

Weeks 7 to 9: Definition, examples and properties of ring homomorphisms; First, second and third isomorphism theorems for rings; The field of quotients. [1]: Chapter 15. [2]: Chapter 7 (Section 7.3 [Theorem 7, and Theorem 8((1), and (2))]).

Weeks 10 and 11: Polynomial rings over commutative rings, Division algorithm and consequences. [1] Chapter 16 (except proof of Theorems 16.2, and 16.3).

Weeks 12 and 13: Factorization of polynomials, Reducibility tests, Mod p Irreducibility test, Eisenstein's criterion, Unique factorization in $\mathbb{Z}[x]$. [1] Chapter 17 up to Theorem 17.6, page 297 (Theorems 17.3, 17.4, and 17.6 without proof).

Weeks 14 and 15: Divisibility in integral domains, Irreducibles, Primes, Unique factorization domains, Euclidean domains. [1] Chapter 18 (except proof of Ascending Chain Condition Lemma, and Theorem 18.3).

Essential Readings:

1. Gallian, Joseph. A. (2017). Contemporary Abstract Algebra (9th ed.). Cengage Learning India Private Limited, Delhi. Indian Reprint 2021.
2. Dummit, David S. & Foote, Richard M. (2016). Abstract Algebra (3rd ed.). Student Edition. Wiley India.

Teacher's Name: Dr. Subodh Kumar

Course: B. Sc. (Physical Sciences with electronics)

Semester: III

Paper: DSC-14: Differential Equations

Weeks 1 and 2: First order ordinary differential equations: Basic concepts and ideas, First order exact differential equations, Integrating factors and rules to find integrating factors. [2]: Chapter 1 (Sections 1.1, and 1.2), Chapter 2 (Sections 2.1, 2.2, and 2.4 up to page 64).

Week 3: Linear equations and Bernoulli equations, Initial Value Problems, Applications of first order differential equations: Orthogonal trajectories and Rate Problems. [2]: Chapter 2 (Sections 2.3), Chapter 3 (Section 3.1 up to page 74, and Section 3.3 up to page 94).

Weeks 4 and 5: Basic theory of higher order linear differential equations, Wronskian and its properties. [2]: Chapter 4 (Sections 4.1 up to page 115).

Weeks 6 and 7: Linear homogeneous equations with constant coefficients, Linear nonhomogeneous equations, Method of undetermined coefficients. [2]: Chapter 4 (Section 4.1 from page 120 onwards, Sections 4.2, and 4.3).

Weeks 8 and 9: Method of variation of parameters (only second order), Two-point boundary value problems, Cauchy- Euler equations, Systems of linear differential equations. [2]: Chapter 4 (Sections 4.4, and 4.5). [2]: Chapter 1 (Section 1.3 up to page 16). [2]: Chapter 7 (Sections 7.1, and 7.3).

Weeks 10 and 11: Partial differential equations: Basic concepts and definitions, Classification and construction of first-order partial differential equations, Method of characteristics and general solutions of first order partial differential equations. [1]: Chapter 2 (Sections 2.1 to 2.3, and 2.5).
Weeks 12 and 13: Canonical forms and method of separation of variables for first-order partial differential equations. [1]: Chapter 2 (Sections 2.6, and 2.7).

Weeks 14 and 15: Classification and reduction to canonical forms of second-order linear partial differential equations and their general solutions. [1]: Chapter 4 (Sections 4.1 to 4.4).

Essential Readings:

1. Myint-U, Tyn and Debnath, Lokenath (2007). Linear Partial Differential Equations for Scientist and Engineers (4th ed.). Birkhäuser. Indian Reprint.
2. Ross, Shepley L. (1984). Differential Equations (3rd ed.). John Wiley & Sons.