



**SECOND SEMESTER 2020-21**  
Course Handout Part II

Date:16.01.2021

In addition to part-I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

Course No. : MATH F314  
Course Title : Algebra II  
Instructor-in-Charge : Pratyusha Chattopadhyay  
Instructor : Pratyusha Chattopadhyay

**Scope and Objective of the Course:** Basic Field Theory, Vector Spaces, and Linear Algebra are the fundamental building blocks of abstract algebra. Knowledge of this course will help a student to pursue courses on advanced algebra.

The objective of this course is to introduce basics of modules, field extensions, vector spaces, and linear transformations. In this course one will learn about definitions of modules, basic facts about modules, vector spaces & dual vector spaces, definitions and examples of fields, field extension, degree of extension, algebraic element, splitting field, normal extensions, Galois extension & Galois group, linear transformations, characteristic roots & characteristic polynomials, and certain canonical forms of transformations.

**Text Book:**

1. I. N. Herstein, Topics in Algebra, 2<sup>nd</sup> Edition, John Wiley.

**Reference Books:**

1. Dummit & Foote, Abstract Algebra, 3<sup>rd</sup> Edition, Wiley.
2. I.B.S. Passi, Field Theory, Alpha Science International Limited.
3. P.M. Cohn, Basic Algebra, Springer, 1st Edition.
4. K.M.Hoffman & R. Kunze, Linear Algebra, Pearson, 2<sup>nd</sup> Edition.

**Course Plan:**

Lecture No.	Learning objectives	Topics to be covered	Chapter in the Text Book
1-5	Vector spaces and dual spaces	Basics of vector spaces and dual spaces	4.1 – 4.3
6-8	Modules	Basics of modules	4.5
9-13	Extension of fields	Field extension, algebraic element, and transcendental element	5.1, 5.2
14-19	Root of a polynomial	Definition of root, multiplicity of roots, splitting field, and simple extension	5.3, 5.5



20-25	Galois Theory	Galois extension and Galois groups	5.6
26-28	Algebra of Linear Transformations	Algebra of linear transformations and related results	6.1
29-31	Characteristic Roots	Characteristic roots, characteristic vectors, and related results	6.2
32	Matrices	Matrices of linear transformations	6.3
33-35	Canonical Forms: Triangular	Similar transformations, invariant subspaces, and triangular forms	6.4
36-37	Canonical Forms: Nilpotent	Nilpotent transformation, index of nilpotence, and related results	6.5
38-40	Canonical Forms: Jordan	Decomposition of a vector space and Jordan canonical form	6.6

### Evaluation Scheme:

Component	Duration	Weightage (%)	Date & Time	Nature of Component
Mid-semester Exam	90mins	30	02/03 3.30 - 5.00PM	Open book
2 Quizzes and 1 Assignment	Will be announced	30	Will be announced*	Open book
Comprehensive	120 mins	40	05/05 AN	Open book

\*Exact date and duration will be notified later

Total marks is 100

**Chamber Consultation Hour:** To be announced by the Instructor.

**Notices:** The notices concerning this course will be announced on the CMS Notice Board only.

**Make-up Policy:** Make-up for tests will be given only for genuine cases and prior permission has to be obtained from Instructor In-charge.

**Academic Honesty and Integrity Policy:** Academic honesty and integrity are to be maintained by all the students throughout the semester and any type of academic dishonesty is not acceptable.

**INSTRUCTOR-IN-CHARGE (MATH F215)**

