Semester	JAN 2022
Open to semester	14,22
Course code	**MT5214/MT6234**
Course title	**Algebra II**
Credits	4 /4
Course Coordinator & participating faculty (if any)	Chandrasheel Bhagwat
Nature of Course	Lectures
Pre-requisites	Algebra I
Objectives (goals, type of students for whom useful, outcome etc)	Learning topics in commutative algebra, homological algebra, and Galois theory as a part of the graduate-level course. The student is expected to be confident working with the topics learnt in the course and use them as tools in their research (in a variety of areas e.g. commutative algebra, group theory, algebraic/analytic number theory, algebraic geometry, Lie theory, representation theory, Topology, Analysis). The secret agenda is also to teach the students to get comfortable with functorial thinking and train them to use the relevant tools like resolutions and derived functors freely. Utility: This course is not a mandatory course in the official coursework but is highly recommended for all mathematics PhD/ iPhD students.
Course contents (details of topics /sections with no. of lectures for each)	Commutative algebra: Localization, Integral extensions, Going up theorem, Noetherian rings and modules, Primary decomposition in Noetherian rings, Dedekind domains, Discrete valuation rings (~12 Lectures) Homological algebra: Exactness of sequences of modules, Cochain complexes, and cohomology, homomorphisms induced in cohomology by homomorphisms of cochains, long exact sequences in cohomology, Chain homotopy, Projective modules, Injective modules, Ext and Tor functors, Introduction to group cohomology and its applications (~12 Lectures)

	Galois theory: Separability of extensions of fields, Fundamental theorem of Galois theory for finite extensions, Normal basis theorem, Topologizing Galois groups for infinite extensions, Fundamental theorem of Galois theory for infinite extensions, Transcendental extensions (~15 Lectures)
Evaluation /assessment	End-Sem Examination-40% Mid-Sem Examination-0% Others-Three tests with weights 20% each%
Suggested readings (with full list of authors, publisher, year, edn etc.)	We will not follow a particular book for the course. Some useful references are: 1. Introduction to Commutative Algebra by Atiyah and Macdonald 2. Abstract Algebra by Dummit and Foote 3. Algebra by Lang