Core X

Algebra-II

Course Objectives:

To present a systematic study on finite abelian groups, Sylow's theorems and Modules.

Learning Outcomes:

After completing the course the student will be able to

- Know on finite abelian groups, the class equation and Sylow's theorems.
- Know on applications of Sylow's theorems and test the simplicity of groups.
- Learn on group action, composition series, nilpotent groups and solvable groups.
- Solve problems in modules and related results.

Unit I

Fundamental theorem of finite abelian groups, isomorphism classes of abelian groups, proof of the fundamental theorem, Sylow's theorems, conjugacy classes, the class equation, Sylow's first theorem, Cauchy theorem, Sylow's second and third theorems.

Unit II

Application of Sylow's theorem, finite simple groups, non-simplicity tests, the simplicity of alternating group A_5, free groups, classification of groups of order up to 15, characterization of dihedral groups.

Unit III

Group actions and permutation representations, composition series and holder programs, nilpotent groups, solvable groups.

Unit IV

Introduction to modules, definition and examples, direct sum, free modules, quotient modules, homomorphisms, simple modules, modules over PIDs.

Books Recommended:

- ✓ *Joseph A. Gallian, Contemporary Abstract Algebra (4th Edition), Narosa Publishing House, New Delhi, 1999.(IX Edition 2010).*
- ✓ *D. S. Dummit, R. M. Foote, Abstract Algebra, Wiley-India edition, 2013.*
- ✓ *C. Musili, Introduction to Rings and Modules, Narosa Publishing House.*

Books for Reference:

- ✓ *John B. Fraleigh, A First Course in Abstract Algebra, 7th Ed., Pearson, 2002.*
- ✓ *N. Herstein, Topics in Algebra, Wiley Eastern Limited, India, 1975.*
- ✓ *M. Artin, Abstract Algebra, 2nd Ed., Pearson, 2011.*
- ✓ *S. Nanda, Topics in Algebra, Allied Publishers, New Delhi.*
- ✓ *Suggested digital platform: NPTEL/SWAYAM/MOOCs*
- ✓ *e-Learning Source http://ndl.iitkgp.ac.in; http://ocw.mit.edu; http://mathforum.org*