23MA803   **Homological Algebra**   **3 1 0 4**

Course Outcomes (CO's):

CO1: To familiarize with the fundamental concepts of Projective and Injective modules.

CO2: To study the application of the notion homology in the study of Projective and Injective modules.

CO3: To explore the role of resolutions in category theory.

CO4: To learn the techniques in the functors such as Tor and Ext.

Syllabus:

Unit 1: Projective and Injective Modules:

Projective Modules - Injective Modules - Baer's Criterion - An Embedding Theorem.

Unit 2: Homology of Complexes:

Ker-Coker Sequence - Connecting Homomorphism-the General Case - Homotopy.

Unit 3: Derived Functors:

Projective Resolutions - Injective Resolutions - Derived Functors

Unit 4: Torsion and Extension Functors:

Derived Functors-Revisited - Torsion and Extension Functors - Some Further Properties of Tor_R^n - Tor and Direct Limits.

Unit 5: The Functor Ext_R^n:

Ext^1 and Extensions - Baer Sum of Extensions - Some Further Properties of Ext_R^n.

References:

1. Vermani, L. R., An Elementary Approach to Homological Algebra, Chapman & Hall/CRC press, 2003.
2. J. J. Rotman, An Introduction to Homological Algebra (2nd Ed.), Springer Science & Business Media, LLC, 2009.
3. H Cartan and S. Eilenberg, Homological Algebra, (Princeton Mathematical Series) New Age Publishers, 2006.