Course Title: Advance Mathematics- V (Topology & Functional Analysis)
Course Rating: 4 Cr. Hours

Topology
- Definition and examples
- Open and closed sets
- Subspaces
- Neighborhoods
- Limit points, Closure of a set
- Interior, Exterior and boundary of a set

Bases and Sub-bases
- Base and sub bases
- Neighborhood bases
- First and second axioms of countablility
- Separable spaces, Lindelöf spaces
- Continuous functions and homeomorphism
- Weak topologies, Finite product spaces

Separation Axioms
- Separation axioms
- Regular spaces
- Completely regular spaces
- Normal spaces

Compact Spaces
- Compact topological spaces
- Countably compact spaces
- Sequentially compact spaces

Connectedness
- Connected spaces, Disconnected spaces
- Totally disconnected spaces
- Components of topological spaces

Metric Space
- Review of metric spaces
- Convergence in metric spaces
- Complete metric spaces
- Completeness proofs
- Dense sets and separable spaces
- No-where dense sets
- Baire category theorem

Normed Spaces
- Normed linear spaces
- Banach spaces
- Convex sets
- Quotient spaces
- Equivalent norms
- Linear operators
- Linear functionals
- Finite dimensional normed spaces
- Continuous or bounded linear operators
- Dual spaces

Inner Product Spaces
- Definition and examples
- Orthonormal sets and bases
- Annihilators, Projections
- Hilbert space
- Linear functionals on Hilbert spaces
- Reflexivity of Hilbert spaces

Evaluation Criteria

Examination	Type	Marks
Internal Examination	Sessional Work	15%
	Mid-Semester	25%
External Examination	Final Semester	60%

Recommended Books
1. J. Dugundji, *Topology*, (Allyn and Bacon Inc., 1966)
2. G. F. Simmon, *Introduction to Topology and Modern Analysis*, (McGraw Hill Book Company, 1963)
3. Stephen Willard, *General Topology*, (Addison-Wesley Publishing Co., 1970)
4. Seymour Lipschutz, *General Topology*, (Schaum's Outline Series, McGraw Hill Book Company, 2004)

5. E. Kreyszig, *Introduction to Functional Analysis with Applications*, (John Wiley and Sons, 2006)
6. A. L. Brown and A. Page, *Elements of Functional Analysis*, (Van Nostrand Reinhold, 1970)
7. G. Bachman and L. Narici, *Functional Analysis*, (Academic Press, 1966)
8. F. Riesz and B. Sz. Nagay, *Functional Analysis*, (Dover Publications, Inc., 1965)