Syllabus:

Dual space consideration: Representation of duals of the spaces c_{00} with p-norms, c_0 and c with supremun-norm, l-p, C[a, b] and L^p. Reflexity; Weak and weak* convergences. Operations on Banach and Hilbert spaces: Compact operators between normed linear spaces; Integral operators as compact operators; Adjoint of operators between Hilbert spaces; Self adjoint, normal, unitary operators; Numerical range and numerical radius; Hilbert-Schmidt operators. Spectral results for Banach and Hilbert space operators; Eigen spectrum, Approximate eigen spectrum and resolvent; Spectral radius formula, Spectral mapping theorems; Riesz-Schauder theory; Spectral results for normal, self- adjoint, unitary operators; Functions of self-adjoint operators. Spectral representation of operators: Spectral theorem and singular value representation for compact self-adjoint operators; Spectral theorem for self-adjoint operators.

Text books:

1. Conway J. B., A course in Functional Analysis, Springer-Verlag, 1990.
2. Rudin W., Functional Analysis, Tata Mcgraw-Hill, 1974.

References:

1. B.V. Limaye, Functional Analysis, 2nd Edition, New Age International, 2008. 2. Edouard Goursat, A Course in Mathematical Analysis, Nabu Press, 2013. 3. Kreyszig, Introduction to Di_erential Geometry and Reimannian Geometry, University of Toronto press, 1969.
4. A.E. Taylor and D.C. Lay, Introduction to Functional Analysis, 2nd Edition, Wiley, New York, 1980

Code:MAT5016: Operations Research Prerequisites:	L	T	P	Credit
	3	2	0	4

Course Category	Elective
Course Type	Theory
Course Objective	Operations research helps in solving problems in different environments

	that needs decisions. This module aims to introduce students to use quantitative methods and techniques for effective decisions–making; model formulation and applications that are used in solving business decision problems
Course Outcome(s)	Identify and develop operational research models from the verbal description of the real system. Understand the mathematical tools that are needed to solve optimisation problems. Use mathematical software to solve the proposed models. Develop a report that describes the model and the solving technique, analyse the results and propose recommendations in language understandable to the decision-making processes in Management and Engineering

Syllabus:

Introduction, uses and limitations. Preliminaries - Convex functions, modeling, formulation of linear programming problems. Graphical method, theory of simplex method -Simplex Algorithm - Charnes M-Method - Two phase method, Computational complexity of simplex Algorithm - Karmarker's Algorithm. Duality in linear programming, Dual simplex method, Sensitivity analysis, Bounded variable problem,

Transportation problem, Integrity property, MODI Method, Degeneracy -Unbalanced problems. Assignment problem - Hungarian method - Routing problems Dynamic programming problem - Bellmann's optimality principle - Cargo loading problem - Replacement problem - Multistage production planning and allocation problem. Game theory - Rectangular Games - Two persons zero sum games - Pure and mixed strategies - 2 X n and m X2 games - Relation between theory of games and linear programming.

Critical path analysis - Probability consideration in PERT. Distinction between PERT and CPM - Resources Analysis in network scheduling - Time cost optimization algorithm - Linear programming formulation - Introduction to optimization softwares. Non –linear programming problems.

Text books:

1. Frederick S. Hillier, Gerald J. Lieberman, Bodhibrata Nag and Preetam Basu, Introduction to Operations Research, McGraw-Hill, 10th Edition, 2017.

References:

1. M. S. Bazaara, J. J. Jarvis and H.D. Sherali, Linear programming and Network flows, John Wiley, 2nd Edition, 2009.
2. M. S. Bazaara, H. D. Sherali and C. M. Shetty, Nonlinear programming Theory and Algorithms, John Wiley, 2nd Edition, 2006.
3. Taha H. A., Operations Research - An Introduction, Prentice Hall India, 7th Edition, 2006. 4. Hadley G., Linear Programming, Narosa Book Distributors, 2002.

Code:MAT5017: Optimization Techniques and Control Theory Prerequisites:	L	T	P	Credit
	3	2	0	4

Course Category	Elective
Course Type	Theory