MEOL1	OPERATIONS RESEARCH	L	T	P	C	Int	Ext
		2	1	-	3	30	70
	OPEN ELECTIVE – M.E.						

COURSE OBJECTIVES:

1. Grasp the methodology of OR problem solving and formulate linear programming problem
2. Develop formulation skills in transportation models and assignment problems.
3. Understand the basics in the field of queuing theory and game theory
4. Be able to know how project management techniques help in planning and scheduling a project and to provide basics of simulation and its application to queuing and inventory problems.

COURSE OUTCOMES:

After completion of the course, the students will be able to

1. Recognize the importance and value of Operations Research and linear programming in solving practical problems in industry.
2. Interpret the transportation models' solutions and infer solutions to the real-world problems.
3. Recognize and solve queuing and game theory problems
4. Gain knowledge of drawing project networks for quantitative analysis of projects and know when simulation can be applied in real world problems

COURSE CONTENT:

UNIT-1	CO1	12

Linear Programming : Definition and Scope of Operations Research, Mathematical formulation of the problem, graphical method, Simplex method, artificial basis technique, dual Simplex method, Degeneracy, alternative optima, unbounded solution, infeasible solution

UNIT-2	CO2	12

Transportation Problem: Introduction to the problem, LP formulation of a transportation problem. Basic feasible solution by north-west corner method, Vogel's approximation method, least cost method. Finding optimal solution by MODI method, degeneracy, unbalanced transportation matrix and Maximization in transportation model.

Assignment Problem: One to one assignment problem, optimal solutions, unbalanced assignment matrix, travelling sales man problem, maximization in A.P.

UNIT-3	CO3	12

Queuing Theory: Queuing systems and their characteristics. Classification, Models - (M/M/1:∞/FCFS), (M/M/1: N /FCFS).

Theory of Games: Introduction, rectangular two person zero sum games, solution of rectangular games in terms of mixed strategies, solution of 2x2 games without saddle point, concept of dominance to reduce the given matrix, Graphical method for 2xn and nx2 games

UNIT-4	CO4	12

Project Planning through Networks: Introduction, Basic steps in PERT/CPM techniques, Network diagram presentation, Rules of drawing network diagram, Fulkerson's rule, Time estimates and Critical path in network analysis, floats, Project evaluation and review technique, Application areas of PERT/CPM techniques.

Simulation: Introduction, Monte-Carlo Simulation, Application to Inventory Control, Application to Queuing Problems

LEARNING RESOURCES:

TEXT BOOK(S):

1. S.D. Sharma, 'Operations Research' Kedarnath, Ramnath & Co.,Meerut , 11th   Edition , 2002.
2. Gupta and Hira, 'Operations Research' , S.Chand Publishers, 2011.
3. H.A. Taha, 'Operations Research', Pearson, 7th Edition, June 2002

REFERENCE BOOK(S):

1. S.S. Rao, 'Optimization Theory and Applications,, John Wiley & Sons , 1996
2. Phillips, Ravindran, James Soldberg, 'Introduction to Operations Research', Wiley 1976
3. Hiller and Liberman ,'Introduction to Operations Research' , MGH, 7th Edition, 2002

MEOL2	APPLIED MECHANICS & MECHANICAL ENGINEERING	L	T	P	C	Int	Ext
		2	1	-	3	30	70
	OPEN ELECTIVE – M.E.						

Course Objectives

1. To understand the various coplanar forces applied to a body and method of resolving the forces and determination of resultant force, and conditions required for equilibrium, and also to know what is centre of gravity and moment of inertia and their importance and determining them for simple objects

2. To know the different stresses developed/induced when the body is subjected to external forces or temperature changes and to know the hoop and longitudinal stresses developed in the thick and thin cylinders when subjected to internal pressure and also determine the change in the dimensions of the cylinder due to these stresses and strains.

3. To understand the formation of steam and different properties associated with it and working principles of boilers, different mountings and accessories used for the safety operation of boilers and also to understand the basic principles and Refrigeration & Air-Conditioning and Applications.

4. To impart the knowledge about different drive systems like belts and gear drives and to know about the working principles and importance of different bearing and couplings.

COURSE OUTCOMES:

After successful completion of the course, the students are able to

1. The student must be in a position to understand different coplanar forces and determine the resultant forces. He/she is also able to estimate centre of gravity and moment of inertia for simple objects.

2. The student must be able to estimate the tensile, compressive, shear and thermal stresses in a body when subjected for different forces, change in temperature etc., He/she can also understand the difference between thick and thin cylinders and able to estimate hoop and longitudinal stresses, changes

3. The student can understand the formation of steam, working principles of Babcock and Wilcox boilers, different mountings and accessories used in the boilers and the principles of Refrigeration & Air-Conditioning.

4. The student must be in a position to know how the power is transmitted through belt and gear drives, estimate the tensions, power transmitted, length of the belt required etc., He is also in position to understand the importance of bearing and couplings in power transmission

COURSE CONTENT:

UNIT I   [CO:1] (12)

Forces: Concurrent Forces, Composition and Resolution of coplanar Forces, Equilibrium of Coplanar forces.Section Properties: Centre of gravity and Moment of Inertia of simple and composite elements (Problems related to simple objects only).

UNIT II   [CO:2] (12)

Stress and Strain: Simple stress and strain, Hooke's Law, Stress strain diagram for brittle and ductile materials- Factor of safety, Thermal stresses, Lateral strain, Modulus of rigidity, Bulk modulus-Relation between G,K and C, (Problems on simple stresses, elongations only)Thin and Thick Cylinders: Thin and thick circular cylinders subjected to internal and external pressure. Thin and thick cylinders with spherical ends. Lame's theorem and application to thick cylinders.

UNIT III   [CO:3] (12)

Steam: Generation of steam, Properties of steam, Use of steam tables and Mollier chart-(Problems related to enthalpy, entropy, specific volume calculations for different conditions of steam only- No problems on non flow processes). Steam Generators: Classification – Working of Cochran and Babcock-Wilcox boilers only- Accessories and mountings (Listing and functions only).Refrigeration & Air-Conditioning Basics: Principles of Refrigeration & Air-Conditioning –Applications – COP – Turn of Refrigeration – Measures of Refrigeration – Air-Refrigeration System – Vapour Compression Refrigeration System – Psychrometry – Psychometric properties – Psychometric Processes, Psychometric Chart – Summer Air-conditioning Systems.

UNIT IV   [CO:4] (12)

Drives: Belts Classification, Expression for the ratio of tensions on the slack and tight side, Power transmitted, V-belts, Chain drives-Simple problems only. Gears: Classification – Spur, Bevel, Helicalgears and applications. Bearings: Purpose of bearings, Slipper bearing, Thrust bearing, Ball and Roller bearings. Couplings: Flange, Flexible couplings, Hook's joint, Universal coupling

LEARNING RESOURCES:

TEXT BOOK(s):

1. Strength of Materials, S. Ramamrutham, 17thEdition, Dhanpath Rai Publishers, Delhi (Unit – I, II) (2011)
2. Elements of Mechanical Engineering, Mathur, and Mehta Jain Brothers, Delhi (Unit – III, IV), (2005)
3. Treatise on Heat Engineering, V. P.Vasandhani&Kuma, Metropolitan Publishers.
4. Refrigeration & Air-Conditioning by R.S.Kurmi & Gupta, Chand & Company.

REFERENCE BOOK(s):

1. Applied Mechanics & Strength of Materials, R. S. Khurmi, 13thEdition, S. Chand & Co. (1977).
2. Basic Mechanical Engineering, T.J.Prabhu & Others, 1stEdition, SciTech Publishers (2010).