

**B.E Semester: VIII**

**Mechanical Engineering**

**Subject Name: Operations Research**

**A. Course Objective**

- To develop a solution oriented approach by in depth knowledge of Operations Research.
- To address the underlying concepts, methods and application of operations research.

**B. Teaching / Examination Scheme**

SUBJECT		Teaching Scheme				Total Credit	Evaluation Scheme					Total Marks
		L	T	P	Total		THEORY		IE	CIA	PR. / VIVO	
		Hrs	Hrs	Hrs	Hrs		Hrs	Marks	Marks	Marks	Marks	
ME801	Operation Research	4	0	2	6	5	3	70	30	20	30	150

**C. Detailed Syllabus**

- 1 **Introduction to operations research:**  
Introduction and History of O.R., Definition and Characteristics of O.R., Scope and areas of application of O.R., Phases of O.R.
- 2 **Linear programming:**  
Introduction of linear programming (LPP), Mathematical formulation of the problem, graphical solution, simultaneous linear equations, slack and surplus variable, simplex method, procedure to obtain optimal solution by simplex method, approximation and equality, variable unrestricted design, alternative optimal solution minimization and Maximization problem BIG M and TWO PHASE methods, degeneracy. Duality in LPP, Dual problem and its construction, interpretation and properties, Dual simplex algorithm.
- 3 **Transportation techniques:**  
Mathematical statement of T.P. Methods to obtaining the initial basic feasible solution. (viz. : NWCR, VAM, LCEM ) optimal solution by stepping stone and MODI methods, Minimization and maximization problems, conditional allocations over time problems, Transshipment problem.
- 4 **Assignment techniques:**  
Mathematical statement of problem, Technique for solution, Hungarian method, modified matrix, maximization and minimization problem, routing problems, travelling salesmen problem.
- 5 **Replacement theory:**  
Introduction, replacement of equipment that deteriorate and become obsolete, replacement of equipment that do not degenerate but fail,. Replacement by alternative equipment, money value changing with times. Replacement with salvage value considered. Group replacement policy.
- 6 **Queuing theory:**  
Introduction, input process, queue discipline, service mechanism, inter arrival times, service time, Kendall's notation queuing models, M/M/1 and with finite queue model with poisson arrival with exponential service, multi-channel queuing model. The [ M/M/1 : ( /SIRO ) ] model III [ M/M/1 : ( N/FIFO ) ] model IV ( Birth death process M/M/C Queuing systems with M/M/C : ( / FIFO ) M/M/C (N/FIFO) M/M/C (C/FIFO) Queues in series.
- 7 **Theory of games:**  
Introduction, Two person zero sum games, The maxi min, mini max principle, Games without saddle point – mixed strategies Graphical solution of 2XN and MX2 Games,

**D. Lesson planning**

<b><u>SR. NO.</u></b>	<b><u>DATE/WEEK</u></b>	<b><u>UNIT NO.</u></b>	<b><u>%WEIGHTAGE</u></b>	<b><u>TOPIC NO.</u></b>
1	1 <sup>ST</sup> , 2 <sup>ND</sup> , 3 <sup>RD</sup>	1, 2	20	1, 2
2	4 <sup>TH</sup> , 5 <sup>TH</sup> , 6 <sup>TH</sup>	3	20	3
3	7 <sup>TH</sup> , 8 <sup>TH</sup> , 9 <sup>TH</sup>	4, 5	20	4, 5
4	10 <sup>TH</sup> , 11 <sup>TH</sup> , 12 <sup>TH</sup>	6	20	6
5	13 <sup>TH</sup> , 14 <sup>TH</sup> , 15 <sup>TH</sup>	7	20	7

**E. Instructional Method & Pedagogy**

1. At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
2. Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all topics while teaching and conduction of all examinations.
3. Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation.
4. One/Two internal exams may be conducted and total/average/best of the same may be converted to equivalent of 30 marks as a part of internal theory evaluation.
5. Assignment based on course content will be given to the student for each unit/topic and will be evaluated at regular interval. It may carry an importance of ten marks in the overall internal evaluation.
6. Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overall internal evaluation.
7. The course includes a laboratory, where students have an opportunity to build an appreciation for the concept being taught in lectures.
8. **Practical / Oral:** Term work shall be carried out to fulfill the practical credits related to course contents.

**F. Students Learning Outcomes**

- The student can identify different areas of Operations Research.
- Can find the applications of all the areas in day to day life.

**G. Recommended Study Materials****Text & Reference Books:**

1. Operation Research - by J K Sharma
2. Quantitative Techniques in Management – by N D Vora
3. Operations Research – by Hira
4. Operation Research - by Kanti Swarup & Manmohan, Sultan Chand & Co.
5. Operation Research - by R.C. Patel – N.R. Dave, C. Jamnadas & Co.
6. Operation Research - by V. K. Kapoor, Sultan Chand & Co.
7. Operations Research for Management – by G. V. Shenoy & Shrivastav.
8. Operations Research by Taha