| Course Code | Course Name | Category | L | T | P | Credit | Year of Introduction |
|---|---|---|---|---|---|---|---|
| **23MAL4MB** | **Operations Research for Management** | **Minor** | **3** | **0** | **0** | **3** | **2023** |

**i) COURSE OVERVIEW**

This course equips students with probabilistic and mathematical models to solve real-life problems in management and engineering. It enables effective decision-making under resource constraints and provides foundational support for advanced studies, specialized courses, and research.

**ii) COURSE OUTCOMES**

After the completion of the course, the student will be able to:

| | | |
|---|---|---|
| CO 1 | Apply concepts of game theory to analyze situations involving conflict of interest among two or more decision-makers across various fields | Apply |
| CO 2 | Apply CPM and PERT techniques to identify the critical path and project duration for effective project planning, scheduling, and control | Apply |
| CO 3 | Apply dynamic programming techniques to determine the shortest path in a given network | Apply |
| CO 4 | Apply inventory control and replacement models to optimize inventory systems and minimize maintenance costs | Apply |
| CO 5 | Apply queuing theory models to design systems and evaluate key performance measures dynamically | Apply |

**iii)**

**SYLLABUS**

Game and decision theory covering zero-sum games, dominance, and decision-making under risk and uncertainty; project and network models including CPM, PERT, shortest path, minimum spanning tree, and maximum flow; dynamic programming with recursive formulation and LPP solutions; inventory and replacement models such as EOQ/EBQ and deterministic and probabilistic systems; and queuing theory with queue characteristics, Kendall's notation, and basic M/M/1 and M/M/c models.

iv) **(a) TEXT BOOKS**

1. Frederick S. Hillier & Gerald J. Lieberman – *Introduction to Operations Research*, 11th Edition (2024)
2. Hamdy A. Taha – *Operations Research: An Introduction*, 11th Edition (2024)
3. S. D. Sharma – *Operations Research*, 2013 Edition

**(b) REFERENCES,.**

1. Gupta P.K., Man Mohan, “Problems in Operations Research” (Methods and Solutions), Sultan Chand and Sons, Ninth Edition, 2003.
2. J.K.Sharma,” Operations Research” ( Theory and Applications),Macmillan India Ltd, Second Edition, 2003
3. Kalavathy S, Operations Research, 2nd Edition, Vikas Publications, 2009
4. N. D. Vohra, “Quantitative Management”, Tata McGraw Hill, 2006.
5. Sundaresan V, Ganapathy K.S, Ganesan K, Resource Management Technique- LakshmiPublications,2003.

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**v) COURSE PLAN**

| Module | Contents | No. of hours |
|---|---|---|
| **I** | Game Theory And Decision Theory:Two person zero sum games – Saddle point – Dominance rule - Graphical solution. Decision Theory: Concepts of decision making; Decision environments; Decision under uncertainty and under risk . | **9** |
| **II** | Project management: Guidelines for network construction, Critical path method (CPM), Project evaluation and reviewtechnique (PERT), NetworkTechniques: Shortest path problem, Dijkstras Algorithm, Maximum flowproblem,Minimum spanning tree problem, Prim’s algorithm. | **9** |
| **III** | The Recursive Equation approach- Characteristics of Dynamic programming-Dynamic programming Algorithm- Solution of Discrete D.P.P-Some applications-Solution of L.P.P by Dynamic Programming | **9** |
| **IV** | Inventory Models – Staffing problem- Simple Inventory Problems: Deterministic inventory with and without shortage; Single period probabilistic inventory models with and without setup cost, EOQ and EBQ Models (With and without shortages), Quantity Discount Models. Replacement Models-Individual replacement Models (With and without time value of money) – Group Replacement Models. | **9** |
| **V** | Queuing Theory- Queues-Characteristics of Queues-Kendal’s notation-Random arrivals-Arrival and Departure Distributions-Types of Queues- Basic Queuing models- M/M/1:∞/FIFO - $P_n=\rho^n P_0$ (no proof)-<br>Derivation of the following Characteristics<br>(a) Probability that queue size ≥n<br>(b) Average number of customers in the system<br>(c) Average length of the waiting line – Waiting time distribution (no proof) – Waiting time in the system – Waiting time in the queue - Little’s Formulae – Problems based on the above results. | **9** |

| | | |
|---|---|---|
| | M/M/1:N/FIFO model – Formulae (without proof) for the average number of units in the system and in the queue and the average waiting time – Problems. M/M/c:∞/FIFO model – Standard results ( no derivation) - Problems | |
| | **Total hours** | **45** |

**(vi) ASSESSMENT PATTERN**

Continuous Assessment : End Semester Examination – 40 : 60

| Continuous Assessment | | |
|---|---|---|
| Attendance | : | 5 marks |
| Assignments | : | 15 marks |
| Assessment through Tests | : | 20 marks |
| **Total Continuous Assessment** | : | **40 marks** |
| **End Semester Examination** | : | **60 marks** |
| **TOTAL** | | **100 marks** |

**(vii)CONTINUOUS ASSESSMENT TEST**

- No. of tests: 02
- Maximum Marks: 30
- Test Duration: 1 ½ hours
- Topics: 2 ½ modules

**(viii)END SEMESTER EXAMINATION**

- Maximum Marks: 60
- Exam Duration: 3 hours