# M.Sc. (Applied Statistics)
## Semester – III

| Course Code | PS03CAST22 | Title of the Course | OPERATIONS RESEARCH – II |
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| Total Credits of the Course | 4 | Hours per Week | 4 |

| Main Focus of the Course outcomes | Employability | Skill Development | Entrepreneurship |
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| | ✓ | ✓ | |
| Course Objectives: | The main objectives of the course are as follows:<br>1. Ability to understand and analyse managerial problems in industry so that they are able to use resources (capitals, materials, staffing, and machines) more effectively.<br>2. Knowledge of formulating mathematical models for quantitative analysis of managerial problems in industry.<br>3. Skills in the use of Operations Research approaches and computer tools in solving real problems in industry.<br>4. Mathematical models for analysis of real problems in Operations Research. | | |

| Course Content | | |
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| Unit | Description | Weightage* (%) |
| I | Transportation Problem(TP): Introduction, Area of application, mathematical model of TP- maximization and minimization problems, Terminologies used in LPP. Degeneracy,Balanced and unbalanced TP. North-West Corner Method(NWCM), Least Cost Method(LCM), Vogel's Approximation Method(VAM), Modified Distribution Method(MODI) | 25 |
| II | Assignment Problem(AP): Introduction, Area of application, mathematical model of AP – maximization and minimization problems,Hungarian Method, Multiple Optimal Solutions. | 25 |
| III | Network Analysis: Introduction, Minimal spanning tree problem, Maximal flow problem. PERT and CPM- Terminologies used, Similarity and Differences, steps in PERT and CPM. | 25 |
| IV | Inventory Control-Deterministic and Probabilistic models, Non-linear Programming Problem- Kuhn-Tucker Conditions, Introduction to Simulation Techniques and Sequencing Problems. | 25 |

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| Teaching-Learning Methodology | Interactive Class Lectures, ICT tools used |

| Evaluation Pattern | | |
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| Sr. No. | Details of the Evaluation | Weightage |
| 1. | Internal Written / Practical Examination (As per CBCS R.6.8.3) | 15% |
| 2. | Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3) | 15% |
| 3. | University Examination | 70% |

| Course Outcomes: Having completed this course, the learnerwill be able to | |
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| 1. | formulate a real-world problem as a mathematical programming model |
| 2. | solve network models like the shortest path, minimum spanning tree, and maximum flow problems |
| 3. | understand the applications of, basic methods for, and challenges in non-linear programming |
| 4. | identify, mathematically express and solve transportation problems. |
| 5. | learn optimality conditions for single- and multiple-variable unconstrained and constrained non-linear optimization problems, and corresponding solution methodologies |
| 6. | be able to design and solve simple models of CPM and queuing to improve decision making and develop critical thinking and objective analysis of decision problems. |
| 7. | be able to solve simple problems of replacement and implement practical cases of decision making under different business environments. |
| 8. | identify, mathematically express and solve assignment problems. |

| Suggested References: | |
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| Sr. No. | References |
| 1. | Kambo, N.S.(1991) Mathematical Programming Techniques Affiliated East-West Press Pvt.Ltd. |
| 2. | Operations Research, Paneerselvan, PHI. |
| 3. | Taha, H.A.(1992) Operations Research 5th Ed., Macmillan. |
| 4. | Kanti Swarup, Gupta P. K. and Man Mohan Singh (1977) Operations Research, Sultan Chand & Sons. |
| 5. | N. D. Vohra (2011) Quantitative Techniques in Management, 4th Ed., Mc Graw Hill. |
| 6. | V. K. Kapoor(1998) Problems & Solutions in Operations Research, 2nd Ed., Sultan Chand & Sons. |
| 7. | S. D. Sharma (2001) Operations Research, 13th Ed., Kedar Nath Ram Nath & Co. |
| 8. | J. K. Sharma(2009) Quantitative Techniques For Managerial Decisions, 1st Ed. , Macmillan |

| On-line resources to be used if available as reference material |
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| On-line Resources |
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