M.Phil. [Operations Research] (Full Time)
Curriculum and Syllabus
2016 Regulation

I SEMESTER						
S.No	**Sub. Code**	**Title of Subject**	**L**	**T**	**P**	**C**
1	RMA 001	Linear, Non-Linear Programming And Simulation	4	0	0	4
2	RMA 002	Queueing System	4	0	0	4
		TOTAL	**8**	**0**	**0**	**8**

II SEMESTER						
S.No	**Sub. Code**	**Title of Subject**	**L**	**T**	**P**	**C**
1	RMA 003	Inventory Theory And Dynamic Programming	4	0	0	4
2	RMA 004	Dissertation	0	0	8	8
		TOTAL	**4**	**4**	**8**	**12**

Credit Summary

1st Semester - 08
2nd Semester - 12
Total No. of Credits - 20

RMA 001 LINEAR, NON LINEAR PROGRAMMING AND SIMULATION 4 0 0 4

OBJECTIVES

- To give an in-depth knowledge of Linear, Non Linear Programming and Simulation and their applications.
- To train the students to write definition and problem solving in Simulation.

UNIT I: 12 hours

Convex sets, Extreme points, Convex and concave functions, properties- Linear Programming Problems: Formulation, Graphical solution, Fundamental properties of solutions- Simplex Method- Big-M Method- Two phase Method- Revised Simplex Method. Duality- Primal and Dual LP Problems – Properties – Dual Simplex Method – Sensitivity analysis – Discrete changes in cost vector in requirement vector – Coefficient matrix. Parametric programming – Parameterization of cost vector and requirement vector.

UNIT II: 12 hours

Unimodal and Convex functions, Hessian matrix, Positive definite and Negative definite matrices - One dimensional optimization – Newton's Method – Fibonacci Method – Golden Section Method – Quadratic Interpolation Method.

UNIT III: 12 hours

Multi – dimensional unconstrained optimization – Univariate Method – Neider and Meads Method, Conjugate Directions and Conjugate Gradient – Fletcher – Reeves Method – Davidson – Fletcher – Powell Method.

UNIT IV: 12 hours

Multi dimensional constrained optimization – Lagrange multiplier method – Kuhn – Tucker Conditions – Modified Hookes and Jeeves Method – Interior and Exterior Penalty Function Method.

Quadratic Programming - Wolfe's Method – Beales Method – Geometric Programming Polynomials – Calculus Method – Arithmetic, Geometric inequality Method.

UNIT V: 12 hours

Simulation – Nature and need for simulation – Monte Carlo Method – generation of pseudo random numbers by mid- square method, congruence multiplier method – Test for randomness – generating random variables for known probability distributions – Uniform, Exponential, Erlangian, Poisson, Normal Distributions – Applications to simple problems in Operations Research.

Total No of Hours: 60

TEXT BOOKS:

1. Hillier F.S, Lieberman, *Introduction to Mathematical programming*, McGraw Hill International Edition.

2. Taha, *Operations Research: An Introduction, 6th Edition*., Macmillan.

3. Rao, S.S, *Optimization: Theory and Applications, 2nd Edition*, Wiley Eastern.

4. Bazaara, Shetty, Sherali, *Non – linear Programming: Theory and Algorithms*, Wiley.

RMA 002 **QUEUEING SYSTEM** **4 0 0 4**

OBJECTIVES

- To give an in-depth knowledge of Queueing System and their applications.
- To train the students to write definition and problem solving, Stochastic Processes and Queueing Theory.

UNIT I: **12 hours**

Introduction of Basic concepts in Stochastic Processes, Markov Chain and Markov Processes.

UNIT II: **12 hours**

Queueing Systems, Probability Distribution of Arrival and Service Times.

UNIT III: **12 hours**

Markovian Queueing Systems: M/M/I, M/ M/ C, Finite Source queues. Erlangian, Queueing Systems: M/E_k /I and E_k / M / I . Bulk Queueing Systems. Basic Idea of Priority Systems. Imbedded Markov Chain Models: M/G/I, G/M/I, and M/D/C.

UNIT IV: **12 hours**

Design and Control Problems in Queueing Theory.

UNIT V: **12 hours**

Simulation Procedures: Data Generation and Book – Keeping.

Total No of Hours: 60

TEXT BOOKS:

1. Cooper, R.B, (1981) *Introduction to Queueing Theory, 2nd Edition*, North Holland, 1981.

2. Kleinrock, L. (1975) *Queueing Systems, Volume I* , John Wiley.

3. Gross, D., Harris, C.M(2002) *Fundamentals of Queueing Theory, 3rd Edition*, John Wiley and Sons Inc. Pvt. Ltd.,.

4. Cox, D.R, Smith, W.L (1961) *Queues*, Mathuen.

5. Medhi, J (1991) *Stochastic Models in Queueing Theory*, Academic Press.

6. Satty, T.L (1983) *Elements of Queueing Theory with Applications*, Dover.

7. Prabhu, U.N (2002) *Fundamentals of Queueing Theory, International Series in Operations Research and Management Sciences*, Kluwer Academic Publishers.

RMA 003 INVENTORY THEORY AND DYNAMIC PROGRAMMING 4 0 0 4

OBJECTIVES

- To give an in-depth knowledge of Inventory Theory And Dynamic Programming and their applications.
- To train the students to write definition and problem solving in Inventory control, Dynamic programming and cargo loading and Knapsack problems.

UNIT I: 12 hours

Inventory control – Different variables involved, Single item deterministic – Economic lot size models with uniform rate, finite and infinite production rates, with or without shortage – Multi- item models with one constant.

UNIT II: 12 hours

Deterministic models with price – breaks – All units discount model and incremental discount model. Probabilistic single period profit maximization models with uniform demand, instantaneous demand, with or without setup cost.

UNIT III: 12 hours

Dynamic inventory models, Multi – echelon problems. Integrated approach to production inventory and to maintenance problems. Feed back control in inventory management.

UNIT IV: 12 hours

Dynamic programming – Bellman's principle of optimality, characteristics of a dynamic programming problem. Solutions of simple classical problems with single constraint. Solution to Linear Programming problem and Integer Programming problem using Dynamic programming approach.

UNIT V: 12 hours

Applications of dynamic programming. The shortest path through a network, production planning, inventory problems, investment planning, cargo loading and Knapsack problems.

Total No of Hours: 60

TEXT BOOKS:

1. Starr and Miller (1985) *Inventory control Theory and Practice, 1st Edition*, PHI.

2. Taha, H.A (1996) *Operations Research: An Introduction, 6th Edition*, Macmillan.

3. Robert, E. Larson, John, L. Casti (1982) *Principles of Dynamic Programming Vol – I and II, 1st Edition*, Marcel Dekker.

RMA 004	**DISSERTATION**	**0 0 8 8**