Central University of Punjab, Bathinda

M.Sc. MATHEMATICS

Session 2019-2021

Department of Mathematics and Statistics

Unit-I   **8 Hours**
Formulation of linear programming problems (LPP). Graphical solution to LPPs. Cases of unique and multiple optimal solutions. Unbounded solutions and infeasibility and redundant constraints.

Unit-II   **8 Hours**
Feasible solution, basic feasible solutions, Optimal solution, Convex sets, Solution of LPP with Simplex methods. The dual problem. Formulation of the dual.

Unit-III   **8 Hours**
Transportation and Assignment Problem: Transportation problems, Formulation of transportation problem, Feasible and optimal solution of transportation problems. Assignment problems.

Unit-IV   **6 Hours**
Theory of games: Introduction to basic concepts of game theory including strategic Games.

Suggested Readings:
   1. H. A. Taha, *Operations Research - An Introduction,* Macmillan Publishing Company Inc., New York, 2006.
   2. K . Swarup, P. K. Gupta and Man Mohan, *Operations Research*, Sultan Chand & Sons, New Delhi, 2001.

Course Title: Numerical Methods (VAC)	L	T	P	Cr
Course Code: MAT.529	1	0	0	1
Total Lectures: 30				

Learning outcomes: The objective of this course is to provide the understanding and use of numerical methods for the postgraduate students of other departments.

Unit-I   **7 Hours**
Error Analysis: Relative error, Truncation error, Roundoff error, Order of approximation, Order of convergence, Propagation.

Unit-II   **8 Hours**
Roots of Nolinear Equations: Bisection method, Secant method, Newton Raphson method, Convergence and order of convergence.

Unit-III   **8 Hours**
Linear Systems of Equations: Gauss elimination and Gauss-Seidel methods.
Interpolation: Lagrange's Method, Newton's polynomials.

Unit-IV   **7 Hours**
Solution of Differential Equations: Euler's method, Heun's method, Taylor series method, Runge Kutta method.

TRANSACTION MODE: Lecture/Demonstration/Project Method/ Co Operative learning/   Seminar/Group discussion/Team teaching /Tutorial/Problem solving/E-team teaching/Self-learning.

Suggested Readings:

1. C. F. Gerald and P. O. Wheatly, *Applied Numerical Analysis*, 7th Edition, Pearson LPE, 2009. *Computation*, 6th Edition, New Age International, New Delhi, 2015.
2. J. I. Buchaman and P. R. Turner, *Numerical Methods and Analysis,* Prentice-Hall, 1988.
3. K. Atkinson, *An Introduction to Numerical Analysis,* 2nd Edition, John Wiley & Sons, 2012.
4. M. K. Jain, S.R.K. Iyengar and R.K. Jain, *Numerical Methods for Scientific and Engineering*
5. R. S. Gupta, *Elements of Numerical Analysis*, 2nd Edition, Cambridge University Press, 2015.
6. S. S. Sastry, *Introduction Methods of Numerical Analysis*, 4th Edition, Prentice-Hall, 2005.

SEMESTER-III

Course Title: Research Methodology
Course Code: MAT.502
Total Hours: 60

L	T	P	Cr
4	0	0	4

Learning outcomes:
The objective of this course is to equip the students with knowledge of some basic as well as advanced concepts related to research. The course covers preparation of research plan, reading and understanding of scientific papers, scientific writing, research proposal writing, ethics, plagiarism etc.

Unit-I   **14 Hours**
Introduction: Meaning, Objectives, Characteristics, Significance, and Types of Research; Research Approaches, Research Methods vs. Research Methodology, Research Process, and Criteria of Good Research.