



SRI VENKATESWARA UNIVERSITY - TIRUPATI
Syllabus for 4-Year UG Honors in B.Sc. (Mathematics) as Major
in consonance with Curriculum framework
(W.E.F. AY-2026-27)

COURSE STRUCTURE (for Semester IV)

Year	Semester	Course	Title of the Course	No. of Hrs /Week	No. of Credits
II	IV	8	Linear algebra	5	4
		9	Vector Calculus	5	4
		10	Linear Programming Problems	5	4

SEMESTER-IV

COURSE 10: LINER PROGRAMMING PROBLEMS

Theory

Credits: 4

5 hrs/week

Course Objectives

This course is designed to:

1. To introduce the concept of convex sets and the foundational principles of linear programming.
2. To develop the ability to formulate real-life problems into linear programming models.
3. To provide graphical and algebraic techniques for solving linear programming problems.
4. To equip students with the knowledge of the simplex method, artificial variables, and special cases in LPP.
5. To explore issues such as degeneracy, alternative solutions, unboundedness, and infeasibility in linear programming problems.

Course Outcomes

After successful completion of this course, students will be able to

1. Understand the structure of convex sets, convex combinations, and apply the fundamental theorem of linear programming to real-world problem formulation.
2. Solve LPPs graphically and represent LP problems in standard, canonical, and matrix forms.
3. Apply the simplex method to solve linear programming problems and interpret unbounded or multiple solutions.
4. Use artificial variable techniques such as the Big M-method and the two-phase method to handle constraints with equality and greater-than conditions.
5. Identify and resolve issues in LPP such as degeneracy, alternative and unbounded solutions, and apply the simplex method to solve systems of simultaneous equations.

Course Content

UNIT-I

Convex Set- Extreme points of a convex set- Convex combination- Convex hull- Convex polyhedron- Fundamental theorem of linear programming - Formulation of linear programming of problems (LPP)

UNIT-2

Graphical solution of linear programming problems- General formulation of LP problems- Standard form and matrix form of LP problems-Standard form and Canonical form of LP Problems

UNIT-3

Introduction of Simplex method - Definitions and notations - Computational procedure of simplex algorithm- Simple way for simplex computations.

UNIT -4

Artificial variables- Big M-Method and its applications and Two-phase method- Alternative method of two-phase simplex method

UNIT - 5

Degeneracy in LPP and method to resolve degeneracy- Alternative solutions- Unbounded solutions- Non-existing feasible solutions.

Activities

The activities include quizzes, assignments, seminars, and student presentations. Additional tasks involve mini projects, concept flowcharts, operator method charts, peer teaching, LMS-based quizzes, board work challenges, poster presentations, and visual aids like chalk talks to enhance learning and engagement.

Text book

Scope as in “Operations Research” by S.D. Sharma, Kedar Nath, Ram Nath & Co- Meerut.

Reference Book

“Operation Research” by Kanthi Swarup- R.K. Gupta and Manmohan- S. Chand publications, New Delhi.

Model Question Paper

SECTION – A

Answer any FIVE. Each question carries 3 marks.

5 × 3 = 15 Marks

1. Define a convex set with an example.
2. What are extreme points of a convex set?
3. Define convex combination and convex hull.
4. State the Fundamental Theorem of Linear Programming.
5. Write the standard and canonical forms of an LPP.
6. Explain how an LPP is solved graphically.
7. Define a basic feasible solution.
8. Write the steps in the simplex algorithm.
9. What is the purpose of introducing artificial variables?
10. What is meant by degeneracy in an LPP?

SECTION – B

Answer ALL questions. Each question carries 12 marks.

5 × 12 = 60 Marks

11. (a) Define convex polyhedron and convex hull. Show that the set of feasible solutions of an LPP is convex.

OR

(b) A company manufactures two products **A** and **B**. Each unit of **A** requires 4 kg of raw material and 3 labour hours, while each unit of **B** requires 2 kg of raw material and 4 labour hours. The company has a maximum of 40 kg of raw material and 48 labour hours available. The profit per unit is ₹60 for **A** and ₹80 for **B**.

- (i) Formulate this situation as a linear programming problem to maximize profit.
- (ii) Identify the decision variables, objective function, and constraints.
- (iii) Explain why the feasible region of this LPP is convex.

12. (a) Solve the following LPP graphically:

Maximize $Z = 5x + 4y$

subject to $x + 2y \leq 8$, $3x + 2y \leq 12$, $x, y \geq 0$.

OR

- (b) Convert the following LPP into its standard and matrix form:

Maximize $Z = 4x_1 + 3x_2$

subject to $2x_1 + x_2 \leq 8$, $x_1 + x_2 \leq 6$, $x_1, x_2 \geq 0$.

13. (a) Solve the following by the simplex method:

$$\text{Maximize } Z = 3x_1 + 2x_2$$

$$\text{subject to } x_1 + x_2 \leq 4, x_1 + 2x_2 \leq 6, x_1, x_2 \geq 0.$$

OR

(b) Explain the computational procedure of the simplex algorithm with one iteration

Example.

14. (a) Solve using the Big-M method:

$$\text{Maximize } Z = 2x_1 + 3x_2$$

$$\text{subject to } x_1 + x_2 \geq 4, x_1 + 3x_2 \leq 6, x_1, x_2 \geq 0.$$

OR

(b) Use the Two-Phase method to solve:

$$\text{Minimize } Z = x_1 + 2x_2$$

$$\text{subject to } x_1 + x_2 = 3, 2x_1 + 3x_2 \geq 6, x_1, x_2 \geq 0.$$

15. (a) Explain degeneracy and show how it is resolved with an example.

OR

(b) Solve an LPP which has alternative optimal solutions. Also explain unbounded and infeasible solutions with illustrations.

4- Year UG Honours, Major
Syllabus
(2026-27)
Semester-IV

Model Question Paper

Time : 3hrs

Marks:75

Part-A

Answer any Five Questions. Each Question carries 3 Marks.

5x3=15

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

Answer the following questions. Each question carries 12 Marks

5x12=60

11. a) Unit-I
(Or)
b) Unit-I

12. a) Unit-II
(Or)
b) Unit-II

13. a) Unit-III
(Or)
b) Unit-III

14. a) Unit-IV
(Or)
b) Unit-IV

15. a) Unit-V
(Or)
b) Unit-V