NAME:- DR. SUDHIR KUMAR YADAV
DEPARTMENT:- MATHEMATICS

Teaching Plan

DSE: Linear Programming and Applications

Weeks 1 and 2: Linear programming problem: Standard, Canonical and matrix forms, Geometric solution; Convex and polyhedral sets, Hyperplanes, Extreme points.

[1]: Chapter 1 (Sections 1.1, and 1.3), and Chapter 2 (Sections 2.4, and 2.5).

Weeks 3 and 4: Basic solutions, Basic feasible solutions, Correspondence between basic feasible solutions and extreme points.

[1]: Chapter 2 (Section 2.3), and Chapter 3 (Section 3.2).

Weeks 5 to 7: Simplex Method: Optimal solution, Termination criteria for optimal solution of the linear programming problem, Unique and alternate optimal solutions, Unboundedness; Simplex algorithm and its tableau format.

[1]: Chapter 3 (Sections 3.3, and 3.6 to 3.8).

Week 8: Artificial variables, Two-phase method, Big-M method.

[1]: Chapter 4 (Sections 4.1 to 4.3).

Weeks 9 and 10: Duality Theory: Motivation and formulation of dual problem, Primal-Dual relationships, Statements of the fundamental theorem of duality and complementary slackness theorem with examples.

[1]: Chapter 6 (Section 6.1, and Section 6.2 [up to Example 6.4, and Theorem 6.1 to Example 6.5]).

Weeks 11 and 12: Transportation Problem: Definition and formulation, Northwest-corner, Least-cost, and Vogel's approximation methods of finding initial basic feasible solutions; Algorithm for solving transportation problem.

[3]: Chapter 5 (Sections 5.1, and 5.3).

Week 13: Assignment Problem: Mathematical formulation and Hungarian method of solving.

[3]: Chapter 5 (Section 5.4 [up to 5.4.2 except case study]).

Weeks 14 and 15: Game Theory: Two-person zero sum game, Games with mixed strategies, Formulation of game to primal and dual linear programming problems, Solution of games using duality.

[2]: Chapter 15 (Sections 15.1, 15.2, 15.3, and 15.5).

Essential Readings

1. Bazaraa, Mokhtar S., Jarvis, John J., & Sherali, Hanif D. (2010). Linear Programming and Network Flows (4th ed.). John Wiley and Sons. Indian Reprint.

2. Hillier, Frederick S. & Lieberman, Gerald J. (2021). Introduction to Operations Research (11th ed.). McGraw-Hill Education (India) Pvt. Ltd.

3. Taha, Hamdy A. (2017). Operations Research: An Introduction (10th ed.). Pearson.

B.A. (Prog.) with Mathematics as Major (Sem I) Teaching Plan (DSC-2: Topics in Calculus): −

Weeks 1 and 2: Limit of a function, definition of a limit, Infinite limits, Continuity and types of discontinuities. [1] Chapter 2.

Weeks 3 and 4: Differentiability of a function, Successive differentiation: Calculation of the *n*th derivatives, Leibnitz theorem. [1] Chapter 3 (Sections 3.1, and 3.2), and Chapter 5.

Week 5: Partial differentiation, Euler's theorem on homogeneous functions. [1] Chapter 12 [Section 12.2 (12.21 without proof, exclude 12.22 and 12.23), and Section 12.3].

Weeks 6 and 7: Rolle's theorem, Mean value theorems and applications to monotonic functions and inequalities. [1] Chapter 7 (Sections 7.4 to 7.6).

Weeks 8 and 9: Taylor's theorem with Lagrange's and Cauchy's form of remainders, Definition and examples of convergent sequences and series, Taylor's series, Maclaurin's series expansions of and sin x, cos x, log(1+x).

[1] Chapter 6 (Brief introduction of convergence from the Sections 6.1 and 6.2).

[1] Chapter 7 (Sections 7.7, and 7.8).

Week 10: Indeterminate forms.

[1] Chapter 16.

Week 11: Asymptotes (parallel to axes and oblique).

[1] Chapter 9 (Sections 9.1 to 9.4).

Weeks 12 and 13: Concavity and inflexion points, Singular points (cusp, node and conjugate), Tangents at the origin and nature of singular points, Curve tracing (cartesian and polar equations).

[1] Chapter 10 (Section 10.7).

[1] Chapter 11. Use only statement for nature of double points in the Section 11.4.

Week 14 and 15: Reduction formulae and their applications. [2] Chapter 4 (Sections 4.1, 4.11, 4.12, and 4.13).

References:

1. Prasad, Gorakh (2016). *Differential Calculus* (19th ed.). Pothishala Pvt. Ltd. Allahabad.

2. Prasad, Gorakh (2015). *Integral Calculus*. Pothishala Pvt. Ltd. Allahabad

GE: Fundamentals of Calculus:

Weeks 1 and 2: Limit of a function, definition of a limit, Infinite limits, Continuity and types of discontinuities. [1] Chapter 2.

Weeks 3 and 4: Differentiability of a function, Successive differentiation: Calculation of the *n*th derivatives, Leibnitz theorem. [1] Chapter 3 (Sections 3.1, and 3.2), and Chapter 5.

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Weeks 6 and 7: Rolle's theorem, Mean value theorems and applications to monotonic functions and inequalities. [1] Chapter 7 (Sections 7.4 to 7.6).

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[1] Chapter 6 (Brief introduction of convergence from the Sections 6.1 and 6.2).

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Week 10: Indeterminate forms.

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[1] Chapter 9 (Sections 9.1 to 9.4).

Weeks 12 and 13: Concavity and inflexion points, Singular points (cusp, node and conjugate), Tangents at the origin and nature of singular points, Curve tracing (cartesian and polar equations).

[1] Chapter 10 (Section 10.7).

[1] Chapter 11. Use only statement for nature of double points in the Section 11.4.

Week 14 and 15: Reduction formulae and their applications. [2] Chapter 4 (Sections 4.1, 4.11, 4.12, and 4.13).

References:

1. Prasad, Gorakh (2016). *Differential Calculus* (19th ed.). Pothishala Pvt. Ltd. Allahabad.

2. Prasad, Gorakh (2015). *Integral Calculus*. Pothishala Pvt. Ltd. Allahabad