K L Deemed to be University
CSE-1 -- KLVZA
Course Handout
2025-2026, Odd Sem

Course Title	:MATHEMATICAL OPTIMIZATION
Course Code	:24MT2012
L-T-P-S Structure	: 2-2-0-0
Pre-requisite	:
Credits	: 4
Course Coordinator	:Murali Krishna Puttagunta
Team of Instructors	:
Teaching Associates	:

Syllabus :CO1: Introduction to Optimization: Types of optimization problems, Applications across disciplines. Linear Programming: Formulation of LP Problem (LPP), Graphical method, Simplex method.(maximization and minimization) Duality concept in LPP. Transportation problem, Assignment method. CO2:, Integer Programming, Branch & bound algorithms, valid inequalities & cut plane method. Constrained optimization: Gradient descent Newton's method Conjugate gradient method. CO3: Non-Linear Programming : Quadratic programs – Constrained quadratic programming problems, Beale's method, Wolfe method, Karush-Kuhn Tucker (KKT) Conditions. Geometric Programming: Problems with one-degree of difficulty with positive coefficients, Geometric programming with constraints, Problems with positive and negative coefficients. CO4: Infinite Dimensional Optimization : Heuristic and Meta heuristics, Single solution vs. population-based, Evolutionary algorithms Genetic Algorithm, Trajectory algorithms- Simulated annealing, Tabu search. Nature-inspired metaheuristics-Ant-colony optimization, Particle swarm optimization

Text Books :T1. Applied Mathematical Programming by Bradley, Hax, and Magnanti, Addison-Wesley, 1977. T2- Introduction to Operations Research by Frederick S. Hillier & Gerald J. Lieberman , McGraw Hill,2024 T3 - Linear and Non Linear Programming Theory and Algorithms by MOKHTAR S. BAZARAA, HANIF D. SHERALI and C.M. SHETTY,2005.

Reference Books :1. Introduction to Mathematical Programming, Russell C. Walker, Pearson,1999 2. An Introduction to Optimization by Edwin K. P. Chong and Stanislaw H. Zak, John Wiley & Sons. 4th edition 2013 3. Convex Optimization by Stephen Boyd & Lieven Vandenberghe Cambridge University Press. First released in 2004

Web Links :W1. https://coral.ise.lehigh.edu/~ted/teaching/ie406/ W2.https://statweb.stanford.edu/~candes/teaching/math301/ W2. https://ming- zhao.github.io/Optimization-and-earning/html/docs/conic_programming.html W3. https://epubs.siam.org/doi/book/10.1137/1.9780898718799?mobileUi=0& W4. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-251j-introduction-to mathematical-programming-fall-2009/ W5. https://nptel.ac.in/courses/111/105/111105039/ W6. https://nptel.ac.in/courses/110105096

MOOCS :M1. https://www.coursera.org/learn/operations-research-modeling M2. https://www.coursera.org/learn/operations-research- algorithms#syllabus M3. https://www.coursera.org/learn/operations-research-theory#syllabus M4. https://www.coursera.org/learn/approximation-algorithms-part-2 Self-learning Regular: M4.https://www.coursera.org/learn/linear-algebra-machine-learning M5. https://www.linkedin.com/learning/applied-machine-learning- algorithms/ M6. https://www.coursera.org/learn/approximation-algorithms-part-2

Course Rationale : This course equips students with foundational and advanced optimization technique ranging from linear and nonlinear programming to metaheuristic algorithms applicable across engineering, economics, and computational sciences. It emphasizes both classical methods and modern, nature-inspired strategies to solve real-world, constrained, and high-dimensional optimization problems effectively.
Course Objectives : The objective of this course is to introduce students to the fundamental concepts, techniques, and applications of mathematical optimization. Students will learn to formulate optimization problems, understand the theoretical underpinnings of various optimization methods (linear, nonlinear, integer, convex, and combinatorial), and develop the skills to solve these problems using both analytical and computational tools. The course aims to prepare students to apply optimization techniques to real-world scenarios in engineering, data science, operations research, economics, and other related fields.

COURSE OUTCOMES (COs):

CO NO	Course Outcome (CO)	PO/PSO	Blooms Taxonomy Level (BTL)
CO1	Apply various methods for finding the optimal solution of Linear Programming Problem.	PSO1,PO1,PO2	3
CO2	Apply Integer Programming and Gradient methods for solving optimization problems.	PSO1,PO1,PO2	3
CO3	Express a practical problem, such as an engineering analysis or design problem and to optimize a multivariate quadratic function subject to linear constraints on the variables.	PSO1,PO2,PO3	3
CO4	Apply and understand the search and optimization methodologies applicable to the resolution of multi disciplinary decision problems, under a decision support framework.	PSO1,PO2,PO3	3

COURSE OUTCOME INDICATORS (COIs)::

Outcome No.	Highest BTL	COI-1	COI-2	COI-3
CO1	3	**Btl-1** Remember the basic aspects of Linear Programming concepts and applications	**Btl-2** Explain LPP and Solving LPP using graphical and simplex methods	**Btl-3** Apply Transportation problem and assignment problem
CO2	3	**Btl-1** Remember the basic concept of inter programming and various methods to solve IPP	**Btl-2** Understanding the concept of Branch & Bound method .	**Btl-3** Applying Techniques related to Gradient based methods
CO3	3	**Btl-1** Remember the basic aspects of geometric programming and identify the conditions to apply various approximation methods	**Btl-2** Explain Geometric Programming problems with one-degree of difficulty.	**Btl-3** Apply Geometric Programming for Quadratic optimization, make use of quadratic programming.
CO4	3	**Btl-1** Remember the basic idea of genetic algorithm and randomised algorithms	**Btl-2** Btl-2 Explain Ant-colony optimization, Particle swarm optimization, Simulated	**Btl-3** Apply Heuristic and Meta heuristics, Single solution vs. population-based, Parallel

			annealing, Evolutionary algorithms.	meta heuristics Nature-inspired metaheuristics.

PROGRAM OUTCOMES & PROGRAM SPECIFIC OUTCOMES (POs/PSOs)

Po No.	Program Outcome
PSO1	An ability to design and develop software projects as well as Analyze and test user requirements.
PO1	Engineering Knowledge:Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	Problem Analysis: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
PO3	Design/Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

Lecture Course DELIVERY Plan:

Sess.No.	CO	COI	Topic	Book No[CH No][Page No]	Teaching-Learning Methods	EvaluationComponents
1	CO1	COI-1	Discussion on Course Handout, Question Paper Pattern	Handout Documents	Talk	ALM,End Semester Exam,Home Assignment,SEM-EXAM1,Tutorial
2	CO1	COI-2	Types of optimization problems, Applications across disciplines	R2, Ch3 pp-26-44	Chalk,LTC,PPT,Talk	ALM,End Semester Exam,Home Assignment,SEM-EXAM1,Tutorial
3	CO1	COI-3	Introduction to Linear Programming Problems (LPP)	R2, Ch3 pp-26-44	Chalk,LTC,PPT,Talk	ALM,End Semester Exam,SEM-EXAM1
4	CO1	COI-3	Formulation of LP Problem (LPP) Graphical method	R1Ch2 pp-29-44	Chalk,PPT,Talk	ALM,End Semester Exam,SEM-EXAM1
5	CO1	COI-3	Linear programming concept in Simplex method	R2-Ch4 pp-81-102	Chalk,PPT,Talk	ALM,End Semester Exam,SEM-EXAM1
6	CO1	COI-3	Duality concept in LPP. Transportation problem, Assignment method.	T1[CH13] [Page No. 433-437]	Chalk,PPT,Talk	ALM,End Semester Exam,SEM-EXAM1
7	CO1	COI-3	simplex method minimization problem	R2-Ch4 pp-81-102	Chalk,PPT,Talk	ALM,SEM-EXAM1,Tutorial

Sess.No.	CO	COI	Topic	Book No[CH No][Page No]	Teaching-Learning Methods	EvaluationComponents
8	CO2	COI-3	Types of Integer Programming	R2-Ch11 pp-539-571	Chalk,PPT,Talk	ALM,End Semester Exam,Home Assignment,SEM-EXAM1,Tutorial
9	CO2	COI-3	Gomory cut plane method	R2-Ch11 pp-539-571	Chalk,PPT,Talk	ALM,SEM-EXAM1
10	CO2	COI-3	Branch & bound algorithms	R2-Ch12 pp-539-571	Chalk,PPT,Talk	ALM,End Semester Exam,SEM-EXAM1,Tutorial
11	CO2	COI-3	Constrained optimization: Gradient descent method	t2-Ch8 pp-422-471	Chalk,PPT,Talk	ALM,End Semester Exam,Home Assignment,SEM-EXAM1,Tutorial
12	CO2	COI-3	Constrained optimization: Newton's method	T1[CH13] [Page No. 420-422]	Chalk,PPT,Talk	ALM,Home Assignment
13	CO2	COI-3	Conjugate gradient method.	T1[CH13] [Page No. 420-422]	Chalk,PPT,Talk	ALM,SEM-EXAM1
14	CO3	COI-2	Introduction of Non-Linear Programming : Quadratic programs	T3[CH6] [Page No. 322-325]	Chalk,PPT,Talk	ALM,End Semester Exam,Home Assignment,SEM-EXAM2
15	CO3	COI-3	Karush-Kuhn Tucker (KKT) Conditions,	T3[CH7] [Page No. 311-325]	Chalk,PPT,Talk	ALM,End Semester Exam,Home Assignment,SEM-EXAM2,Tutorial
16	CO3	COI-3	Beale’s method, Wolfes method,	T3[CH6] [Page No. 314-344]	Chalk,PPT,Talk	End Semester Exam,SEM-EXAM2
17	CO3	COI-3	Geometric Programming: Problems with one-degree of difficulty with positive coefficients,	T3[CH6] [Page No. 322-325]	Chalk,PPT,Talk	End Semester Exam,Home Assignment,SEM-EXAM2
18	CO3	COI-3	Geometric programming with constraints	T3[CH6] [Page No. 322-325]	Chalk,PPT,Talk	ALM,End Semester Exam,Home

Sess.No.	CO	COI	Topic	Book No[CH No][Page No]	Teaching-Learning Methods	EvaluationComponents
						Assignment,SEM-EXAM2,Tutorial
19	CO3	COI-3	Geometric Programming Problems with positive and negative coefficients.	T6[CH6] [Page No. 322-325]	Chalk,PPT,Talk	End Semester Exam,SEM-EXAM2
20	CO4	COI-3	Infinite Dimensional Optimization : Heuristic and Meta heuristics	T3[CH1] Page No. 112-134	Chalk,PPT,Talk	ALM,End Semester Exam,Home Assignment,SEM-EXAM2,Tutorial
21	CO4	COI-3	Single solution vs. population based	T3 [CH5] Page No. 98-103	Chalk,PPT,Talk	ALM,End Semester Exam,Home Assignment,SEM-EXAM2,Tutorial
22	CO4	COI-3	Evolutionary algorithms,	T4[CH2] Page No. 25-33	Chalk,PPT,Talk	ALM,End Semester Exam,Home Assignment,SEM-EXAM2,Tutorial
23	CO4	COI-3	Genetic Algorithm	T2 [CH8] Page No. 189-212	Chalk,PPT,Talk	ALM,End Semester Exam,Home Assignment,SEM-EXAM2,Tutorial
24	CO4	COI-3	Trajectory algorithms-Simulated annealing, Tabu search.	T2 [CH5] Page No. 189-212	Chalk,PPT,Talk	ALM,End Semester Exam,SEM-EXAM2,Tutorial
25	CO4	COI-3	Nature- inspired metaheuristics-Ant-colony optimization	T3 [CH8] Page No. 288-312	Chalk,PPT,Talk	ALM,End Semester Exam,Home Assignment,SEM-EXAM2,Tutorial
26	CO4	COI-3	Particle swarm optimization	T2 [CH9] Page No. 289-317	Chalk,PPT,Talk	End Semester Exam,SEM-EXAM2,Tutorial

Lecture Session wise Teaching – Learning Plan

SESSION NUMBER : 1

Session Outcome: 1 Able to understand Mathematical Optimization

Time(min)	Topic	BTL	Teaching-Learning	Active Learning

			Methods	Methods
5	Attendance	2	Talk	--- NOT APPLICABLE ---
20	Tell the course objectives , the course outcomes	2	Talk	--- NOT APPLICABLE ---
20	Explain the course structure	2	Talk	--- NOT APPLICABLE ---
5	Recall the session	2	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 2

Session Outcome: 1 Able to understand Mathematical Optimization

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Attendance	2	Talk	--- NOT APPLICABLE ---
20	Introduction to Linear Programming Problems (LPP)	3	PPT	--- NOT APPLICABLE ---
20	Introductionto OPtimization	3	PPT	--- NOT APPLICABLE ---
5	Recall the session	3	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 3

Session Outcome: 2 Introduction to Linear Programming Problem

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Attendance	3	Talk	--- NOT APPLICABLE ---
40	Introduction to Linear Programming Problems (LPP)	3	PPT	One minute paper
5	Recall the session	3	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 4

Session Outcome: 3 Apply Graphical Method for an LPP

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Attendance	3	Talk	--- NOT APPLICABLE ---
40	Formulation of LP Problem (LPP) Graphical method	3	PPT	--- NOT APPLICABLE ---
5	Recall the session	3	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 5

Session Outcome: 3 Student can able to apply Simplex method

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Attendance	3	Talk	--- NOT APPLICABLE ---
40	Linear programming concept in Simplex method	3	PPT	Debate
5	Recall the session	3	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 6

Session Outcome: 3 Student can able to apply Duality concept in LPP and Assignment method.

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Attendance	3	Talk	--- NOT APPLICABLE ---
20	Duality concept in LPP.	3	PPT	One minute paper
20	Transportation problem, Assignment method.	3	PPT	--- NOT APPLICABLE ---
5	Recall the session	3	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 7

Session Outcome: 3 Student can able to apply simplex method

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Attendance	2	Talk	--- NOT APPLICABLE ---
40	simplex method minimization problem	3	PPT	One minute paper
5	Transportation problem, Assignment method.	3	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 8

Session Outcome: 2 Student shall able to understand the concept of Integer Programming

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Attendance	3	Talk	--- NOT APPLICABLE ---
20	Integer Programming,	3	PPT	--- NOT APPLICABLE ---
20	Branch & bound method	3	PPT	--- NOT APPLICABLE ---
5	Recall the session	3	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 9

Session Outcome: 3 Students shall apply Gomory cut plane method

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Attendance	3	Chalk	--- NOT APPLICABLE ---
40	Gomory cut plane method ,	3	Talk	One minute paper
5	Recall the session	3	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 10

Session Outcome: 3 Students shall apply Branch & bound algorithms

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Attendance	3	Talk	--- NOT APPLICABLE ---
40	Explain Branch & bound algorithm	3	PPT	One minute paper
5	Recall the session	3	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 11

Session Outcome: 3 Students shall able to apply Gradient descent method

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Attendance	3	Talk	--- NOT APPLICABLE ---
40	explain introduction to Constrained optimization, Gradient descent method	3	PPT	One minute paper
5	Recall the session	3	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 12

Session Outcome: 3 Students shall able to apply Newtons method

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Attendance	3	Talk	--- NOT APPLICABLE ---
40	Explanation of Newton's method	3	PPT	--- NOT APPLICABLE ---
5	Recall the session	3	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 13

Session Outcome: 3 Students shall able to apply Conjugate gradient method.

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Attendance	3	Talk	--- NOT APPLICABLE ---
40	Explanation of Conjugate gradient method.	3	PPT	--- NOT APPLICABLE ---
5	Recall the session	3	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 14

Session Outcome: 2 student can able to understand Non-Linear Programming concept

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Attendance	3	Talk	--- NOT APPLICABLE ---
20	Discuss Non-Linear Programming	3	PPT	--- NOT APPLICABLE ---
20	explanation of Quadratic programs	3	PPT	One minute paper
5	Recall the session	3	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 15

Session Outcome: 3 Students shall able to apply Karush-Kuhn Tucker (KKT) Conditions,

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Attendance	3	Chalk	--- NOT APPLICABLE ---
40	Karush-Kuhn Tucker (KKT) Conditions	3	PPT	--- NOT APPLICABLE ---
5	Recall the session	3	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 16

Session Outcome: 3 Students shall able to apply Beale's method

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Attendance	3	Talk	--- NOT APPLICABLE ---
20	Illustrate beale's method	3	PPT	--- NOT APPLICABLE ---
20	Illustrate Wolfe method	3	PPT	One minute paper
5	Recall the session	3	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 17

Session Outcome: 3 Geometric Programming Problems with one-degree of difficulty with positive coefficients

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Attendance	3	Talk	--- NOT APPLICABLE ---
40	Explanation of Geometric Programming Problems with one-degree of difficulty with positive coefficients.	3	PPT	One minute paper
5	Recall the session	3	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 18

Session Outcome: 3 Student can able to apply Geometric programming with constraints

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Attendance	3	Talk	--- NOT APPLICABLE ---
40	explanation of Geometric programming with constraints	3	PPT	--- NOT APPLICABLE ---
5	Recall the session	3	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 19

Session Outcome: 2 Student can able to understand Geometric Programming Problems with positive and negative coefficients. problem

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Attendance	3	Chalk	--- NOT APPLICABLE ---
40	Geometric Programming Problems with positive and negative coefficients.	3	PPT	--- NOT APPLICABLE ---
5	Recall the session	3	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 20

Session Outcome: 2 Student can understand the Infinite Dimensional Optimization

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Attendance	3	Talk	--- NOT APPLICABLE ---
40	Explanation of Infinite Dimensional Optimization. Heuristic and Metaherustic	3	PPT	One minute paper
5	Recall the session	3	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 21

Session Outcome: 3 student can understand the difference between the Single solution vs. population based

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Attendance	2	Talk	--- NOT APPLICABLE ---
40	explanation of Single solution vs. population based	3	PPT	--- NOT APPLICABLE ---
5	Recall the session	3	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 22

Session Outcome: 3 Students shall able to apply Evolutionary algorithms

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Attendance	3	Talk	--- NOT APPLICABLE ---
40	Types of Evolutionary algorithms	3	PPT	Case Study
5	Recall the session	3	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 23

Session Outcome: 3 Students can able to apply Genetic Algorithm.

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Attendance	3	Talk	--- NOT APPLICABLE ---
40	Explanation of Genetic Algorithm.	3	PPT	--- NOT APPLICABLE ---
5	Recall the session	3	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 24

Session Outcome: 2 Student can able to understand different types of Trajectory algorithms

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Attendance	3	Talk	--- NOT APPLICABLE ---
40	explanation of Trajectory algorithms.Simulated annealing, Tabu search.	3	PPT	One minute paper
5	Recall the session	3	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 25

Session Outcome: 2 Student can able to understand the Nature- inspired metaheuristics algorithms

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods

5	Attendance	3	Talk	--- NOT APPLICABLE ---
40	Explanation of Nature- inspired metaheuristics-Ant-colony optimization	3	Talk	--- NOT APPLICABLE ---
5	Recall the session	3	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 26

Session Outcome: 3 Students shall able to apply Particle swarm optimization

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Attendance	3	Talk	--- NOT APPLICABLE ---
40	Explanation of Particle swarm optimization.	3	PPT	One minute paper
5	Recall the session	3	Talk	--- NOT APPLICABLE ---

Tutorial Course DELIVERY Plan:

List of Experiments supposed to finish in Open Lab Sessions:

Lab session no	List of Experiments	CO-Mapping
1	Solve Formulation of LPP using Graphical Method.	CO1
2	Solve linear programming problem using the Simplex Method and the Principle of Duality	CO1
3	List out the steps involved in solving the Transportation problem using North-West corner rule?	CO1
4	Enumerate the steps involved in Gomory’s cutting plane method.	CO2
5	Discrete Optimization using Branch and Bound method Solve the integer programming problem	CO2
6	Describe the gradient based Methods.	CO3

Lab session no	List of Experiments	CO-Mapping
7	Solve the Quadratic Optimisation Programming Problem using Wolfe's method	CO3
8	Solve the quadratic optimisation problems using the Beale method.	CO3
9	Describe the geometric programming problem with positive coefficients.	CO3
10	Understanding different approaches for solving problems of Ant Colony Optimization	CO4
11	Write down the steps involved in solving the problem using Genetic Algorithm	CO4
12	Write down the steps involved in solving the problem using particle swarm optimization.	CO4

Tutorial Session wise Teaching – Learning Plan

SESSION NUMBER : 1

Session Outcome: 2 Student can able to apply Linear Programming concept

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Attendance	3	Talk	--- NOT APPLICABLE ---
40	Linear Programming - mathematical solution	3	PPT	--- NOT APPLICABLE ---
5	Recall the session	3	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 2

Session Outcome: 2 Student can able to apply Graphical Method and Simplex method

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Attendance	3	PPT	--- NOT APPLICABLE ---
40	Graphical Method and Simplex method	3	PPT	--- NOT APPLICABLE ---

5	Recall the session	3	PPT	--- NOT APPLICABLE ---

SESSION NUMBER : 3

Session Outcome: 2 Student can able to apply Transportation problem

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Attendance	3	Talk	--- NOT APPLICABLE ---
40	Transportation Problem	3	PPT	--- NOT APPLICABLE ---
5	Recall the session	3	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 4

Session Outcome: 3 Student can able to apply Gomory’s cutting plane method.

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
10	Attendance	3	Talk	--- NOT APPLICABLE ---
40	Gomory’s cutting plane method	3	PPT	--- NOT APPLICABLE ---
40	Gomory’s cutting plane method	3	PPT	--- NOT APPLICABLE ---
10	Recall the session	3	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 5

Session Outcome: 3 Students shall able to apply Branch and Bound method

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
10	Attendance	3	Chalk	--- NOT APPLICABLE ---

40	Branch and Bound method	3	PPT	--- NOT APPLICABLE ---
40	Branch and Bound method	3	PPT	--- NOT APPLICABLE ---
10	Recall the session	3	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 6

Session Outcome: 3 Students shall able to apply gradient based Methods

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
10	Attendance	3	Talk	--- NOT APPLICABLE ---
40	gradient based Methods	3	PPT	--- NOT APPLICABLE ---
40	gradient based Methods	3	PPT	--- NOT APPLICABLE ---
10	Recall the session	3	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 7

Session Outcome: 3 Students shall able to apply Wolfe’s method

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
10	Attendance	3	Talk	--- NOT APPLICABLE ---
40	Wolfe’s method	3	PPT	--- NOT APPLICABLE ---
40	Wolfe’s method	3	PPT	--- NOT APPLICABLE ---
10	Recall the session	3	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 8

Session Outcome: 3 Students shall able to apply Beales Method

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
10	Attendance	3	Talk	--- NOT APPLICABLE ---
40	Solve the quadratic optimisation problems using the Beale method.	3	PPT	--- NOT APPLICABLE ---
40	Solve the quadratic optimisation problems using the Beale method.	3	PPT	--- NOT APPLICABLE ---
10	Recall the session	3	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 9

Session Outcome: 3 geometric programming problem with positive coefficients

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
10	Attendance	3	Talk	--- NOT APPLICABLE ---
40	Describe the geometric programming problem with positive coefficients.	3	PPT	--- NOT APPLICABLE ---
40	Describe the geometric programming problem with positive coefficients.	3	PPT	--- NOT APPLICABLE ---
10	Recall the session	3	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 10

Session Outcome: 3 Student can able to apply Ant Colony Optimization

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
10	Attendance	3	Talk	--- NOT APPLICABLE ---
40	Ant Colony Optimization	3	PPT	--- NOT APPLICABLE ---

40	Ant Colony Optimization	3	PPT	--- NOT APPLICABLE ---
10	Recall the session	3	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 11

Session Outcome: 3 Student shall able to apply Genetic Algorithm

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
10	Attendance	3	Talk	--- NOT APPLICABLE ---
40	Genetic Algorithm	3	PPT	--- NOT APPLICABLE ---
40	Genetic Algorithm	3	PPT	--- NOT APPLICABLE ---
10	Recall the session	3	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 12

Session Outcome: 3 Student can able to apply particle swarm optimization

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
10	Attendance	3	Talk	--- NOT APPLICABLE ---
40	particle swarm optimization	3	PPT	--- NOT APPLICABLE ---
40	particle swarm optimization	3	PPT	--- NOT APPLICABLE ---
10	Recall the session	3	Talk	--- NOT APPLICABLE ---

Practical Course DELIVERY Plan: NO Delivery Plan Exists

Practical Session wise Teaching – Learning Plan

No Session Plans Exists

Skilling Course DELIVERY Plan: NO Delivery Plan Exists

Skilling Session wise Teaching – Learning Plan

No Session Plans Exists

WEEKLY HOMEWORK ASSIGNMENTS/ PROBLEM SETS/OPEN ENDEDED PROBLEM-SOLVING EXERCISES etc:

Week	Assignment Type	Assignment No	Topic	Details	co
1	Weekly Homework Assignments	1	Solve a LPP using Simplex Method	A hotel has requested a manufacturer to produce pants and jackets for their boys. For materials, the manufacturer has 750 m² of cotton textile and 1,000 m² of silk. Every pair of pants (1 unit) needs 2 m² of silk and 1 m² of cotton. Every jacket needs 1.5 m² of cotton and 1 m² of silk. The price of the pants is fixed at $50 and the jacket, $40. What is the number of pants and jackets that the manufacturer must give to the hotel so that these items obtain a maximum sale? Formulate the problem using mathematical modeling of LPP and solve the LPP using Simplex Method.	CO1
2	Weekly Homework Assignments	2	Transportation Problem	The distribution manager of a company needs to minimize global transport costs between a set of three factories (supply points) S1, S2, and S3, and a set of four distributors (demand points) D1, D2, D3, and D4. The following table shows the transportation cost from each supply point to every demand point, the supply of the product at the supply points, and the demand of the product at the demand points F/D D1 D2 D3 D4 Supply S1 19 30 50 10 7 S2 70 30 40 60 9 S3 40 8 70 20 18 Demand 5 8 7 14 34 Solve Transportation problem using	CO1

				Column Minimum method in Linear Programming	
3	Weekly Homework Assignments	3	Integer Programming	Discrete Optimization using Cutting Plane method Solve the integer programming problem Maximize: Z=3x1+x2+3x3 Subject to- x1+2x2+x3≤4 2x2-3/2 x3≤1 x1-3x2+2x3≤3 Where x1,x2,x3≥0 and integer. Get the optimal solution as an integer value using Gomory's cutting plane method.	CO2
4	Weekly Homework Assignments	4	Gradient Method	10. Given the following set of ordered pairs (3,8), (9,6), (5,4), (3,2), and assume that the relationship between x,y is approximately linear(y=mx+c). Your task is to optimize the parameters m (slope) and c (intercept) by minimizing the Mean Squared Error (MSE) cost function using the gradient descent algorithm.	CO2
5	Weekly Homework Assignments	5	Beale's Method	Discuss about Beale's method.	CO3
6	Weekly Homework Assignments	6	Quadratic Programming	Use Wolfe's method for solving quadratic equation Max Z= 4x_1+6x_2-2x_1^2-2x_1 x_2-2x_2^2 Subject to: x_1+2x_2≤2 and x_1,x_2≥0	CO3
11	Weekly Homework Assignments	8	Particle Swarm Optimization Algorithm	Solve using Particle Swarm Optimization Maximize: f(x)=x_1^2-x_1 x_2+x_2^2+2x_	CO4
12	Weekly Homework Assignments	7	Ant Colony Optimization Algorithm	An ANT is at a distance of 5m from the TREE 15m from CAR and 4m from a DOLL, the distance between TREE and the CAR is 4m,CAR and DOLL is 1m ,DOLL and TREE is 8m.Create a matrix and solve using Ant Colony Optimization.	CO4

COURSE TIME TABLE:

	Hour	1	2	3	4	5	6	7	8	9

Day	Component									
Mon	Theory	--	--	--	--	--	--	--	--	--
	Tutorial	--	--	--	--	--	--	--	--	--
	Lab	--	--	--	--	--	--	--	--	--
	Skilling	--	--	--	--	--	--	--	--	--
Tue	Theory	---	---	V-S201,V-S202,V-S203,V-S204,V-S205,V-S206,V-S207,V-S208,V-S209,V-S210,V-S211,V-S212,V-S213	V-S201,V-S202,V-S203,V-S204,V-S205,V-S206,V-S207,V-S208,V-S209,V-S210,V-S211,V-S212,V-S213	V-S101,V-S102,V-S103,V-S104,V-S105,V-S106,V-S107,V-S108,V-S109,V-S110,V-S111	V-S101,V-S102,V-S103,V-S104,V-S105,V-S106,V-S107,V-S108,V-S109,V-S110,V-S111	---	---	---
	Tutorial	---	---	--	--	V-S112,V-S113	V-S112,V-S113	---	---	---
	Lab	---	---	--	--	--	--	---	---	---
	Skilling	---	---	--	--	--	--	---	---	---
Wed	Theory	---	---	V-S112,V-S113	V-S112,V-S113	---	---	---	---	---
	Tutorial	---	---	V-S101,V-S102,V-S103,V-S104,V-S105,V-S106,V-S107,V-S108,V-S109,V-S110,V-S111	V-S101,V-S102,V-S103,V-S104,V-S105,V-S106,V-S107,V-S108,V-S109,V-S110,V-S111	---	---	---	---	---
	Lab	---	---	--	--	---	---	---	---	---
	Skilling	---	---	--	--	---	---	---	---	---
Thu	Theory	---	---	---	---	--	--	---	---	---
	Tutorial	---	---	---	---	V-S201,V-S202,V-S203,V-S204,V-S205,V-S206,V-S207,V-S208,V-S209,V-S210,V-S211,V-S212,V-S213	V-S201,V-S202,V-S203,V-S204,V-S205,V-S206,V-S207,V-S208,V-S209,V-S210,V-S211,V-S212,V-S213	---	---	---

	Lab	---	---	---	---	---	---	---	---	---
	Skilling	---	---	---	---	---	---	---	---	---
Fri	Theory	--	--	--	--	--	--	--	--	--
	Tutorial	--	--	--	--	--	--	--	--	--
	Lab	--	--	--	--	--	--	--	--	--
	Skilling	--	--	--	--	--	--	--	--	--
Sat	Theory	--	--	--	--	--	--	--	--	--
	Tutorial	--	--	--	--	--	--	--	--	--
	Lab	--	--	--	--	--	--	--	--	--
	Skilling	--	--	--	--	--	--	--	--	--
Sun	Theory	--	--	--	--	--	--	--	--	--
	Tutorial	--	--	--	--	--	--	--	--	--
	Lab	--	--	--	--	--	--	--	--	--
	Skilling	--	--	--	--	--	--	--	--	--

REMEDIAL CLASSES:

Supplement course handout, which may perhaps include special lectures and discussions that would be planned, and schedule notified according

SELF-LEARNING:

Assignments to promote self-learning, survey of contents from multiple sources.

S.no	Topics	CO	ALM	References/MOOCS

DELIVERY DETAILS OF CONTENT BEYOND SYLLABUS:

Content beyond syllabus covered (if any) should be delivered to all students that would be planned, and schedule notified accordingly.

S.no	Advanced Topics, Additional Reading, Research papers and any	CO	ALM	References/MOOCS

EVALUATION PLAN:

Evaluation Type	Evaluation Component	Weightage/Marks		Assessment Dates	Duration (Hours)	CO1	CO2	CO3	CO4
End Semester Summative Evaluation Total= 40 %	End Semester Exam	Weightage	40		180	10	10	10	10
		Max Marks	100			25	25	25	25
In Semester Formative Evaluation Total= 26 %	Home Assignment and Textbook	Weightage	5		30	1.25	1.25	1.25	1.25
		Max Marks	40			10	10	10	10
	Tutorial	Weightage	15		30	3.75	3.75	3.75	3.75
		Max Marks	40			10	10	10	10
	ALM	Weightage	6		30	1.5	1.5	1.5	1.5
		Max Marks	40			10	10	10	10
In Semester Summative Evaluation Total= 34 %	Semester in Exam-II	Weightage	17		90			8.5	8.5
		Max Marks	50					25	25
	Semester in Exam-I	Weightage	17		90	8.5	8.5		
		Max Marks	50			25	25		

ATTENDANCE POLICY:

Every student is expected to be responsible for regularity of his/her attendance in class rooms and laboratories, to appear in scheduled tests and examinations and fulfill all other tasks assigned to him/her in every course
In every course, student has to maintain a minimum of 85% attendance to be eligible for appearing in Semester end examination of the course, for cases of medical issues and other unavoidable circumstances the students will be condoned if their attendance is between 75% to 85% in every course, subjected to submission of medical certificates, medical case file and other needful documental proof to the concerned departments

DETENTION POLICY :

In any course, a student has to maintain a minimum of 85% attendance and In-Semester Examinations to be eligible for appearing to the Semester End Examination, failing to fulfill these conditions will deem such student to have been detained in that course.

PLAGIARISM POLICY :

Supplement course handout, which may perhaps include special lectures and discussions

COURSE TEAM MEMBERS, CHAMBER CONSULTATION HOURS AND CHAMBER VENUE DETAILS:

Supplement course handout, which may perhaps include special lectures and discussions

Name of Faculty	Delivery Component	Sections of	Chamber Consultation	Chamber Consultation	Chamber Consultation	Signature of Course

	of Faculty	Faculty	Day (s)	Timings for each day	Room No:	faculty:
Konda Reddy Nalamalapu	L	101-MA,201-MA	-	-	-	-
Konda Reddy Nalamalapu	T	201-MA,101-MA	-	-	-	-
Mohammed Moulana	L	202-MA	-	-	-	-
Mohammed Moulana	T	202-MA	-	-	-	-
Vamsidhar EniReddy	L	105-MA	-	-	-	-
Vamsidhar EniReddy	T	105-MA	-	-	-	-
Govind D	L	205-MA	-	-	-	-
Govind D	T	205-MA	-	-	-	-
Bikram Basaba	L	211-MA	-	-	-	-
Bikram Basaba	T	211-MA	-	-	-	-
Imran Ali	L	103-MA,213-MA	-	-	-	-
Imran Ali	T	213-MA,103-MA	-	-	-	-
Sreenivasulu Bolla	L	203-MA,104-MA	-	-	-	-
Sreenivasulu Bolla	T	203-MA,104-MA	-	-	-	-
Murali Puttagunta	L	208-MA	-	-	-	-
Murali Puttagunta	T	208-MA	-	-	-	-
vuda sreenivasa rao	L	209-MA,106-MA	-	-	-	-
vuda sreenivasa rao	T	209-MA,106-MA	-	-	-	-
YELISETTY MADHAVILATHA	L	204-MA,107-MA	-	-	-	-
YELISETTY MADHAVILATHA	T	204-MA,107-MA	-	-	-	-
Naveen Mukkapati	L	102-MA	-	-	-	-
Naveen Mukkapati	T	102-MA	-	-	-	-

V Viswanath Shenoi	L	108-MA	-	-	-	-
V Viswanath Shenoi	T	108-MA	-	-	-	-
Lakshmi Ramani Burra	L	109-MA	-	-	-	-
Lakshmi Ramani Burra	T	109-MA	-	-	-	-
LAKSHMI UPPULURI	L	110-MA	-	-	-	-
LAKSHMI UPPULURI	T	110-MA	-	-	-	-
G Venkata Ramana Reddy	L	111-MA	-	-	-	-
G Venkata Ramana Reddy	T	111-MA	-	-	-	-
DRAKSHAYANI SRIRAMSETTI	L	112-MA,206-MA	-	-	-	-
DRAKSHAYANI SRIRAMSETTI	T	112-MA,206-MA	-	-	-	-
Sravani Jayanti	L	210-MA	-	-	-	-
Sravani Jayanti	T	210-MA	-	-	-	-
V SIVARAMARAJU VETUKURI	L	113-MA,207-MA	-	-	-	-
V SIVARAMARAJU VETUKURI	T	113-MA,207-MA	-	-	-	-
LALITHA CHANDRAPATI	L	212-MA	-	-	-	-
LALITHA CHANDRAPATI	T	212-MA	-	-	-	-

GENERAL INSTRUCTIONS

Students should come prepared for classes and carry the text book(s) or material(s) as prescribed by the Course Faculty to the class.

NOTICES

Most of the notices are available on the LMS platform.

All notices will be communicated through the institution email.

All notices concerning the course will be displayed on the respective Notice Boards.

Signature of COURSE COORDINATOR

(Murali Krishna Puttagunta)

Signature of Department Prof. Incharge Academics & Vetting Team Member

Department Of AI&DS

HEAD OF DEPARTMENT:

Approval from: DEAN-ACADEMICS
(Sign with Office Seal) [object HTMLDivElement]