SWARNANDHRA
COLLEGE OF ENGINEERING & TECHNOLOGY
(Autonomous)
Accredited by NBA, AICTE, NEW DELHI • Accredited by NAAC with "A" Grade – 3.32/4.00 CGPA
Recognized by UGC Under Sections 2(f) & 12 (B) of UGC Act 1956
Approved by AICTE, New Delhi, Permanent Affiliated to JNTU K, Kakinada
Seetharampuram, NARSAPUR-534 280, W.G-Dist., Andhra Pradesh

DEPARTMENT OF S & H

TEACHING PLAN

Course Code	Course Title	Year/ Semester	Branch	Contact Periods/ Week	Academic Year	Date of Commencement of Semester
23BS4T03	OPTIMIZATION TECHNIQUES	II/IV	AIML, IT,CSE-DS	60/6	2024-25	16-12-2024

Course Outcomes: *After successful completion of this course, students should be able to*

1	**CO1:**state and formulate the optimization problem, without and with constraints, by using design variables from an engineering design problem.(K2)
2	**CO2:** apply classical optimization techniques to minimize or maximize a multi-variable objective function, without or with constraints, and arrive at an optimal solution.(K3)
3	**CO3:**apply and Solve transportation and assignment problem by using Linear programming Simplex method. (K3)
4	**CO4** : apply gradient and non-gradient methods to nonlinear optimization problems and use interior or exterior penalty functions for the constraints to derive the optimal solutions.(K3)
5	**CO5**: formulate and apply Dynamic programming technique to inventory control, production planning, engineering design problems etc. to reach a final optimal solution from the current optimal solution. (K3)

Unit	Outcome/ Bloom's Level	Topics No.	Topics/Activity	Text Book/ Reference	Contact Hour		Delivery Method
1	CO1:Students are able toState and formulate the optimization problem, without and with constraints, by using design variables from an engineering design problem.(K2)	**UNIT I: Introduction and Classical Optimization Techniques**					
		1.1	Introduction to Optimization techniques	T_1,R_1,R_2	1	12	PPT,BB
		1.2	Statement of an Optimization problem	T_1,R_1,R_2	1		PPT,BB
		1.3	design vector, design constraints, objective function surfaces	T_1,R_1,R_2	1		PPT,BB
		1.4	constraint surface, objective function	T_1,R_1,R_2	1		PPT,BB
		1.5	classification of Optimization problems	T_1,R_1,R_2	1		PPT,BB
			classification of Optimization problems	T_1,R_1,R_2	1		PPT,BB
		1.6	Classical Optimization Techniques: Single variable Optimizationwithout constraints	T_1,R_1,R_2	1		PPT,BB
		1.7	Multi variable Optimization without constraints	T_1,R_1,R_2	1		PPT,BB
		1.8	Necessary and sufficient conditions for minimum/maximum	T_1,R_1,R_2	1		PPT,BB
		1.9	Multivariable Optimization with equality constraints	T_1,R_1,R_2	1		PPT,BB

		1.10	Solution by method of Lagrange multipliers,	T_1,R_1,R_2	1		PPT,BB
		1.11	multivariable Optimization with inequality constraints, Kuhn – Tucker conditions	T_1,R_1,R_2	1		PPT,BB
2	**CO2:** Students are able toapplyclassical optimization techniques to minimize or maximize a multi-variable objective function, without or with constraints, and arrive at an optimal solution.(K3)	**UNIT II: Linear Programming**					
		2.1	Introduction to linear programming	T_1,R_1,R_2	1	12	PPT,BB
		2.2	Standard form of a linear programming problem	T_1,R_1,R_2	1		PPT,BB
			Problems on linear Programming	T_1,R_1,R_2	1		PPT,BB
		2.3	Geometry of linear programming problems,	T_1,R_1,R_2	1		PPT,BB
		2.4	definitions and theorems	T_1,R_1,R_2	1		PPT,BB
		2.5	Solution of a system of linear simultaneous equations	T_1,R_1,R_2	1		PPT,BB
			Problems on solution of a system of linear simultaneous equations	T_1,R_1,R_2	1		PPT,BB
		2.6	Pivotal reduction of a general system of equations,	T_1,R_1,R_2	1		PPT,BB
			Problems on pivotal reduction of a general system of equations,	T_1,R_1,R_2	1		PPT,BB
		2.7	Motivation to the simplex method	T_1,R_1,R_2	1		PPT,BB
		2.8	Simplex algorithm.	T_1,R_1,R_2	1		PPT,BB
			Problems on simplex algorithm	T_1,R_1,R_2	1		PPT,BB
3	CO3: Students are able to apply and Solve transportation and assignment problem by using Linear programming Simplex method. (K3)	**UNIT III: Transportation Problem**					
		3.1	Introduction toTransportation Problem	T_1,R_1,R_2	1	12	PPT,BB
		3.2	Finding initial basic feasible solution by north – west corner rule	T_1,R_1,R_2	1		PPT,BB
			Problems on Finding initial basic feasible solution by north – west corner rule	T_1,R_1,R_2	1		PPT,BB
			Problems onnorth – west corner rule	T_1,R_1,R_2	1		PPT,BB
		3.3	least cost method,related problems	T_1,R_1,R_2	1		PPT,BB
			Problems on least cost method	T_1,R_1,R_2	1		PPT,BB
		3.4	Vogel's approximation method,related problems	T_1,R_1,R_2	1		PPT,BB
			Problems on Vogel's approximation method	T_1,R_1,R_2	1		PPT,BB
		3.5	Testing for optimality of balanced transportation problems	T_1,R_1,R_2	1		PPT,BB
		3.6	Optimality of balanced transportation problems	T_1,R_1,R_2	1		PPT,BB
		3.7	Special cases in transportation problem.	T_1,R_1,R_2	1		PPT,BB
		3.8	Problems on Special cases in transportation problem.	T_1,R_1,R_2	1		PPT,BB
	CO4:Students are able to Apply gradient	**UNIT IV: Nonlinear Programming**					
		4.1	Introduction toNonlinear Programming	T_2,R_2,R_3	1		PPT,BB
		4.2	Unconstrained cases	T_2, R_1,R_2	1		PPT,BB

4	and non-gradient methods to nonlinear optimization problems and use interior or exterior penalty functions for the constraints to derive the optimal solutions.(K3)	4.3	One – dimensional minimization methods: Classification	T_2, R_1,R_2	1	12	PPT,BB
		4.4	Fibonacci method	T_2, R_1,R_2	1		PPT,BB
			Problems on Fibonacci method,	T_2, R_1,R_2	1		PPT,BB
		4.5	Univariate method	T_2, R_1,R_2	1		PPT,BB
		4.6	steepest descent method	T_2, R_1,R_2	1		PPT,BB
		4.8	Constrained cases– Characteristics of a constrained problem,Classification	T_2, R_1,R_2	1	13	PPT,BB
		4.7	Basic approach of Penalty Function method	T_2, R_1,R_2	1		PPT,BB
			Problems on Basic approach of Penalty Function method	T_2, R_1,R_2	1		PPT,BB
		4.8	Basic approaches of Interior and Exterior penalty function methods	T_2, R_1,R_2	1		PPT,BB
		4.9	Problems on Basic approaches of Interior and Exterior penalty function methods	T_2, R_1,R_2	1		PPT,BB
		UNIT V: Dynamic Programming					
5	CO5:Students are able to Formulate and apply Dynamic programming technique to inventory control, production planning, engineering design problems etc. to reach a final optimal solution from the current optimal solution. (K3)	5.1	Introduction toDynamic Programming	T_2, R_1,R_2	1	12	PPT,BB
		5.2	Dynamic programming	T_2, R_1,R_2	1		PPT,BB
			Problems on Dynamic programming	T_2, R_1,R_2	1		PPT,BB
		5.3	Multistage decision processes, types	T_2, R_1,R_2	1		PPT,BB
		5.4	Concept of sub optimization	T_2, R_1,R_2	1		PPT,BB
			Problems onsub optimization	T_2, R_1,R_2	1		PPT,BB
5		5.5	Principle of optimality	T_2, R_1,R_2	1		PPT,BB
			Problems on Principle of optimality	T_2, R_1,R_2	1		PPT,BB
		5.6	Computational procedure in dynamic programming, examples	T_2, R_1,R_2	1		PPT,BB
			computational procedure in dynamic programming, examples	T_2, R_1,R_2	1		PPT,BB
		5.7	Illustrating the calculus method of solution, examples	T_2, R_1,R_2	1		PPT,BB
		5.8	Illustrating the tabular method of solution.	T_2, R_1,R_2	1		PPT,BB
				Cumulative Proposed Periods	**60**		

Text Books:

S. No.	Authors, Book Title, Edition, Publisher, Year of Publication
1	S. S.Rao,"Engineering optimization: Theory and practice", New Age International(P) Limited, 3rd edition, 1998..
2	K.V. Mital and C. Mohan, "Introductory Operations Research", Springer (India), Pvt.LTd.

Reference Books:

S. No	Authors, Book Title, Edition, Publisher, Year of Publication
1	K.V. Mital and C. Mohan "Optimization Methods in Operations Research and systems Analysis", New Age International (P) Limited, Publishers, 3rd edition, 1996.
2	Dr.S.D.Sharma, Kedarnath,Operations Research, Ramnath& Co

Web Details	
1	Classical Optimization Techniques (Introduction and Classical Optimization Techniques)
2	https://byjus.com/maths/linear-programming/ (Linear Programming)
3	Transportation problem (Transportation Problem)
4	https://www.britannica.com/science/optimization/Nonlinear-programming(Nonlinear Programming)
5	https://www.geeksforgeeks.org/introduction-to-dynamic-programming-data-structures-and-algorithm-tutorials/(Dynamic Programming)

		Name	Signature with Date
i.	Faculty I	Mr. P.V.NARAYANA (IT)	P.V.Narayana
ii.	Faculty II	Mr. K.D.N.MURTHY (CSE-DS-A,B)	
iii.	Faculty III	Mrs .P.SUJATHA (AIML-A,B)	15/11/24
iv.	Course Coordinator	Mr. K.D.N.MURTHY	
v.	Module Coordinator	Mr. M.RAVINDRA BABU	M. Ravindra
vi.	HOD of S & H	Dr. V. SWAMINADHAM.	V. Swaminadham

Principal