

Course Code	Course Title	L	T	P	C
BITE415L	Engineering Optimization	3	0	0	3
Pre-requisite	NIL	Syllabus version			
		1.0			
<b>Course Objectives:</b>					
<ol style="list-style-type: none"> <li>1. To understand the role of optimization in engineering design and its importance</li> <li>2. To introduce the different optimization algorithms in linear as well as non-linear programming problems</li> <li>3. To understand the application of non-traditional optimization algorithms</li> </ol>					
<b>Course Outcomes:</b>					
<ol style="list-style-type: none"> <li>1. Identify appropriate optimization method to solve complex problems involved in various industries and understand the concept of single variable and multi variable optimization methods</li> <li>2. Recognize and solve linear and nonlinear optimization methods</li> <li>3. Enumerate fundamentals of quadratic programming technique to solve various optimization problems of engineering</li> <li>4. Design the various bio inspired optimization methods</li> <li>5. Apply various advanced non-linear and fuzzy based optimization</li> </ol>					
<b>Module:1</b>	<b>Classical Optimization Techniques</b>	<b>9 hours</b>			
Introduction - Engineering Applications of Optimization - Classification of Optimization Problems-Single Variable and Multivariable Optimization with no Constraints - Multivariable Optimization with Equality and Inequality Constraints: Lagrange Multipliers Method - Kuhn-Tucker conditions					
<b>Module:2</b>	<b>Linear Programming Problem</b>	<b>5 hours</b>			
Linear Programming Problem – Graphical Methods – Simplex Algorithms – Two Phase Simplex Method – Revised Simplex Method – Dual Simplex Method.					
<b>Module:3</b>	<b>Unconstrained Nonlinear Direct Optimization</b>	<b>4 hours</b>			
Direct Search Methods - Univariate Method - Pattern Directions - Hook and Jeeves' Method					
<b>Module:4</b>	<b>Unconstrained Nonlinear Indirect Optimization</b>	<b>8 hours</b>			
Indirect Search Methods - Gradient of a Function - Cauchy Method - Fletcher-Reeves Method.					
<b>Module:5</b>	<b>Constrained Non-linear Optimization</b>	<b>8 hours</b>			
Characteristics of a Constrained Optimization Problem - Direct Methods: Cutting Plane Method, Methods of Feasible Directions – Indirect Methods - Interior and Exterior Penalty Function Methods					
<b>Module:6</b>	<b>Quadratic programming</b>	<b>4 hours</b>			
Introduction – Applications - Necessary Conditions - Solution to Quadratic Programming Problem using Wolfe's Method.					
<b>Module:7</b>	<b>Bio Inspired Optimization</b>	<b>5 hours</b>			

Introduction - Particle Swarm Optimization - Ant Colony Optimization - Firefly Algorithm - Cuckoo Search Optimization			
<b>Module:8</b>	<b>Contemporary Issues</b>		<b>2 hours</b>
<b>Total Lecture hours:</b>			<b>45 hours</b>
<b>Text Book</b>			
1.	Singiresu S. Rao, (2019), Engineering Optimization - Theory and Practice, John Wiley & Sons, Inc., 4th edition		
<b>Reference Books</b>			
1.	C. B Gupta, Optimization Techniques in Operation Research, I.K. International House Pvt. Ltd. 2012.		
2.	Sherali, H.D., Shetty, C.M., Optimization with Disjunctive Constraints, Springer, 2016.		
Mode of Evaluation: Continuous Assessment Tests, Assignment, Quiz, Final Assessment Test			
Recommended by Board of Studies		12-10-2022	
Approved by Academic Council		No. 68	Date 19-12-2022