

**DEPARTMENT OF CHEMICAL ENGINEERING**  
**NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI**

COURSE PLAN – PART I						
<b>Course Title</b>	OPTIMIZATION TECHNIQUES					
<b>Course Code</b>	CLOE19	<b>No. of Credits</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
			<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>Course Code of Pre-requisite subject(s)</b>	NIL					
<b>Session</b>	Jan 2022	<b>Section (if, applicable)</b>	Not Applicable			
<b>Name of Faculty</b>	<b>Dr S SARAVANAN</b>	<b>Department</b>	Chemical Engineering			
<b>Email</b>	saravanans@nitt.edu	<b>Telephone No.</b>	+91 431-2503116			
<b>Name of Course Coordinator(s) (if, applicable)</b>	Nil					
<b>E-mail</b>	saravanans@nitt.edu	<b>Telephone No.</b>	91-431-2503116			
<b>Course Type</b>	<input type="checkbox"/> Core course		<input checked="" type="checkbox"/>		<b>Elective course</b>	
<b>Syllabus (approved in BoS)</b>						
<p>General: Functions of single and multiple variables - optimality criteria, direct and indirect search methods.</p> <p>Linearization: Constraint optimality criteria, transformation methods based on linearization.</p> <p>Transportation problems.</p> <p>Quadratic and Geometric Programming: Quadratic and geometric programming problems, calculus of variations.</p> <p>Optimality Criteria &amp; Optimal Control Problems: Euler-Lagrange optimality criteria, Pontryagin's maximum principle, optimal control problems. Numerical methods.</p> <p>Artificial Intelligence in Optimization: Introduction to Artificial Intelligence in optimization.</p> <p><b>REFERENCE BOOKS</b></p> <ol style="list-style-type: none"> <li>1. T.F. Edgar and D.M. Himmelblau, <i>Optimization Techniques for Chemical Engineers</i>, McGraw-Hill, New York, 1985.</li> <li>2. S.S.Rao, <i>Engineering Optimization Theory and Practice</i>, Third edition, New Age International Publishers, India.</li> <li>3. K. Deo, <i>Optimization Techniques</i>, Wiley Eastern, 1995.</li> <li>4. R.Panneerselvam, <i>Operation Research</i>, Second edition, PHI, New Delhi, India.</li> <li>5. Prem Kumar Gupta and D.S.Hira, <i>Problems in Operations Research (Principles and Solutions)</i>, S.Chand and company Ltd. New Delhi, India.</li> </ol>						
<b>COURSE OBJECTIVES</b>						
<ol style="list-style-type: none"> <li>1. To understand the concepts and origin of the different optimization methods</li> <li>2. To get a broad picture of various applications of optimization methods used in Engineering.</li> <li>3. To optimize different methods in industry for design and production of products, both economically and efficiently.</li> </ol>						

<b>COURSE OUTCOMES (CO)</b>	
<b>Course Outcomes</b>	<b>Aligned Programme Outcomes (PO)</b>
1. Apply the knowledge of different optimization methods for an optimum design	PO1, PO2, PO3
2. Acquire sufficient knowledge for chemical engineering applications, where optimal decisions need to be taken in the presence of trade-offs between two or more conflicting objectives.	PO1,PO2,PO3,PO4,PO6, PO8,PO10,PO11
3. Implement the theory and applications of optimization techniques in a comprehensive manner for solving linear and non-linear, geometric, dynamic, integer and stochastic programming techniques.	PO1,PO2,PO3,PO4,PO5, PO6,PO7,PO8,PO9, PO10,PO11
4. Identify, formulate and solve a practical engineering problem of their interest by applying or modifying an optimization technique.	PO1,PO2,PO3,PO4,PO5, PO7,PO8,PO9, PO11

<b>COURSE PLAN – PART II</b>			
<b>COURSE OVERVIEW</b>			
To have general awareness and understanding of optimization techniques			
To understand the knowledge of modelling and simulation.			
<b>COURSE TEACHING AND LEARNING ACTIVITIES</b>			
<b>S. No.</b>	<b>Week</b>	<b>Topic</b>	<b>Mode of Delivery</b>
1	Week – 1	General: Functions of single and multiple variables - optimality criteria, direct and indirect search methods	PPT
2	Week – 2 & 3	Linearization: Constraint optimality criteria, transformation methods based on linearization.	PPT
3	Week – 4 & 5	Transportation problems.	PPT
4	Week - 6	Quadratic Programming	PPT
5	Week – 7 & 8	Geometric Programming	PPT
6	Week - 9	Calculus of variations.	PPT
7	Week – 10 & 11	Optimality Criteria Problems, Euler-Lagrange optimality criteria, Pontryagin's maximum principle	PPT
8	Week 12 & 13	Optimal Control Problems, Numerical methods.	PPT
9	Week 14	Introduction to Artificial Intelligence in optimization	PPT

**COURSE ASSESSMENT METHODS (shall range from 4 to 6)**

S. No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Assessment -I	7 <sup>th</sup> week	1 hour	25%
2	Assessment -II	13 <sup>th</sup> week	1 hour	25%
3	Reassessment	15 <sup>th</sup> week	1 hour	25%
4	Assignments		3 days for each assignment	20%
5	Final Assessment		2 hrs	30 % Total:100 marks

**\*mandatory; refer to guidelines on page 4**

**COURSE EXIT SURVEY** (mention the ways in which the feedback about the course shall be assessed)

Students indirect feedback will be collected twice during the course-one in the mid of the course and one at the end of the course on course contents, delivery etc. The academic performance of the students will be assessed based on 2 Assessment (each 25 marks), one final examination (30 marks) and assignments (20 marks).

**COURSE POLICY (preferred mode of correspondence with students, policy on attendance, compensation assessment, , academic honesty and plagiarism etc.)**

**MODE OF CORRESPONDENCE (email/ phone etc)**

The students can contact the course instructor through Email/Phone as given above.

**ATTENDANCE**

A uniform attendance policy for all courses is recommended. At least 75% attendance in each course is mandatory.

The students with less than 75% in any course by the end of 9th week will be identified and complementary assignments may be given to them to be done during 10th week.

A maximum of 10% shall be allowed under On Duty (OD) category.

Students with less than 65% of attendance shall be prevented from writing the final assessment and shall be awarded 'V' grade.

**COMPENSATION ASSESSMENT**

A Student who is absent from a cycle test due to a valid reason only will be allowed to attend the compensation test. The syllabus for the compensation test include both Assessment 1 & 2 portion. No compensation assessment for final assessment.

**ACADEMIC HONESTY & PLAGIARISM**

Possessing a mobile phone, carrying bits of paper, talking to other students, copying from others during an assessment will be treated as punishable dishonesty.

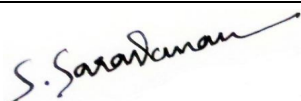
Zero mark to be awarded for the offenders. For copying from another student, both students get the same penalty of zero mark.

The departmental disciplinary committee constituted with the faculty member, PAC chairperson and the HoD, as members shall verify the facts of the malpractice and award the punishment if the student is found guilty. The report shall be submitted to the Academic office.

The policy against academic dishonesty shall be applicable for the current batches also.

**ADDITIONAL INFORMATION**

1. All the students are expected to attend all the classes and Tests without fail.
2. It is advised to maintain the attendance above 75%. On Duty claims to attend the Institute approved co-curricular and extra-curricular activities should be forwarded by the competent authorities.
3. Students absenting from cycle tests, on genuine reason, may appear for retest only once.
4. Dishonesty will be penalized severely.
5. The passing minimum will be fixed as per the Rules and Regulations of the Institute.

**FOR APPROVAL**

**Dr S SARAVANAN**  
Course Faculty



**Dr T SIVASANKAR**  
CC-Chairperson



**Dr P KALAIHELVI**  
HoD

**Guidelines:**

- a) The number of assessments for a course shall range from 4 to 6.
- b) Every course shall have a final assessment on the entire syllabus with at least 30% weightage.
- c) One compensation assessment for absentees in assessments (other than final assessment) is mandatory. Only genuine cases of absence shall be considered.
- d) The passing minimum shall be as per the regulations.

B. Tech. Admitted in				P.G.
2018	2017	2016	2015	
35% or class average/2 whichever is greater.		Peak/3 or class average/2 whichever is lower		40%

- e) Attendance policy and the policy on academic dishonesty & plagiarism by students are uniform for all the courses.
- f) Absolute grading policy shall be incorporated if the number of students per course is less than 10.
- g) Necessary care shall be taken to ensure that the course plan is reasonable and is objective.