




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

<b>COURSE PLAN – PART I</b>						
<b>Course Title</b>	Introduction to Mechanical Engineering					
<b>Course Code</b>	CLPC 13	<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>	July 2018	<b>Section (if, applicable)</b>	Not Applicable			
<b>Name of Faculty</b>	Dr K Muthukumar	<b>Department</b>	Chemical Engineering			
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<b>Name of Course Coordinator(s) (if, applicable)</b>	Dr P Sivashanmugam					
<b>E-mail</b>	psiva@nitt.edu	Telephone No.	91-431-2503106			
<b>Course Type</b>	<input checked="" type="checkbox"/> Core course		<input type="checkbox"/> <b>Elective course</b>			
<b>Syllabus (approved in BoS)</b>						
<p>Laws of Thermodynamics: Thermodynamic systems - closed, open and isolated. Property, state, path and process, quasi-static process, work, Energy. Zeroth, First and Second laws of Thermodynamics (Basic concepts only), Internal energy, Specific heat capacity and Enthalpy.</p> <p>Thermodynamic Cycles: Air standard Cycles: Carnot, Otto, Diesel and Combined cycle; Brayton and Rankine cycles –determination of cycle efficiency.</p> <p>Boilers: Types and classification of boilers: water tube, fire tube, coal, oil and gas fired boilers;Stoker fired, pulverized and fluidized bed boilers. Mountings and accessories. Performance and efficiency calculation of boilers.</p> <p>Properties of Steam:Properties of steam, Mollier chart, determination of dryness fraction of steam-Different types of calorimeters. Concept of Steam distribution systems. steam traps-types and their characteristics. Energy conservation opportunities in steam systems.</p> <p>Turbines and Vacuum Systems: Steam turbines-types and principles: Reaction and impulse turbines; Application of co-generation principles in process industries. Gas turbines-principle and working. Production of Vacuum: Systems and Equipment - Vacuum Pumps, Steam Ejectors; Instrumental methods of Vacuum measurement.</p>						
<b>COURSE OBJECTIVES</b>						
<ol style="list-style-type: none"> <li>1. To understand the basic knowledge of thermodynamic systems used in Chemical Engineering operations.</li> <li>2. To understand basic working principles of boilers.</li> <li>3. To understand the Energy conservation opportunities in steam systems</li> </ol>						

<b>COURSE OUTCOMES (CO)</b>	
<b>Course Outcomes</b>	<b>Aligned Programme Outcomes (PO)</b>
Understand the conceptual laws of thermodynamics for application in thermodynamic cycles.	1,2,3,5,8,11,12
Understand and analyze different thermodynamic cycles and calculate their thermal efficiencies.	1,2,3,5,8,9,11,12
Understand the basics of boilers and perform simple calculations of boiler efficiencies	1,2,3,5,6,8,11,12
Understand the steam distribution and utilization systems to identify the energy conservation opportunities	1,2,3,5,8,11,12
Comprehend principles of steam turbines and calculation of turbine efficiencies; understand the basics of vacuum pumps and instruments for measurement of vacuum.	1,2,3,5,6,8,10,11,12

<b>COURSE PLAN – PART II</b>			
<b>COURSE OVERVIEW</b>			
This course imparts knowledge on basic thermodynamics, that are required to pursue chemical engineering thermodynamics. The students will be impressed to learn the importance of laws of thermodynamics and their applications. The importance of different thermodynamic cycles and production of steam along with its properties will be dealt elaborately. Finally, the working principle of vacuum pumps and turbines will be covered.			
<b>COURSE TEACHING AND LEARNING ACTIVITIES</b>			
<b>S. No.</b>	<b>Week</b>	<b>Topic</b>	<b>Mode of Delivery</b>
1	1	Introduction, Course plan details, Thermodynamic systems, properties, Approaches to Thermodynamics, Energy	C & T
2	2	Energy, Equilibrium, phase rule, reversible process, work	C & T
3	3	Work, heat, I law, Concept of specific heat, enthalpy	C & T
4	4	I law for open system, II law, Entropy	C & T
5	5	Cycles – Carnot, air standard cycles	C & T
6	6	Otto, Diesel and Combined cycle	C & T
7	7	Brayton and Rankine cycles	C & T
8	8	Types and classification of boilers, water tube, fire tube, coal, oil and gas fired boilers,	C & T/PPT
9	9	Stoker fired, pulverized and fluidized bed boilers.	C & T/PPT
10	10	Mountings and accessories. Performance and efficiency calculation of boilers	C & T/PPT
11	11	Properties of steam, Mollier chart, determination of dryness fraction	C & T
12	12	Different types of calorimeters. Concept of Steam distribution systems. steam traps, Energy conservation opportunities	C & T/PPT
13	13	Steam turbines types and principles, Reaction and impulse turbines.	C & T/PPT
14	14	Gas turbines principle and working. Application of cogeneration principles	C & T/PPT
15	15	Vacuum Pumps, Steam Ejectors, Instrumental methods of Vacuum measurement.	C & T/PPT

<b>COURSE ASSESSMENT METHODS (shall range from 4 to 6)</b>				
<b>S. No.</b>	<b>Mode of Assessment</b>	<b>Week/Date</b>	<b>Duration</b>	<b>% Weightage</b>
1	Cycle Test – 1 (Written Exam)	August Fourth week	1 Hour	20%
2	Cycle Test – 2 (Written Exam)	October Second Week	1 Hour	20%
3	Two Assignments	As per the schedule given by the faculty	-	10% (5% each)
4	End Semester (Written Exam)	November	3 hour	50%
CPA	Compensation Assessment*	End of October	1 hour	20%
<b>*mandatory; refer to guidelines on page 4</b>				
<b>COURSE EXIT SURVEY (mention the ways in which the feedback about the course shall be assessed)</b>				
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 cycle tests (each 20 marks), one final examination (50 marks) and assignments (10 marks).				
<b>COURSE POLICY (preferred mode of correspondence with students, policy on attendance, compensation assessment, , academic honesty and plagiarism etc.)</b>				
<b>MODE OF CORRESPONDENCE (email/ phone etc)</b>				
The students can contact the course instructor through Email/Phone as given above.				
<b>ATTENDANCE</b>				
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.				
<b>COMPENSATION ASSESSMENT</b>				
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 Cycle Test 1 & 2 portion. No compensation assessment for final assessment.				
<b>ACADEMIC HONESTY &amp; PLAGIARISM</b>				
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.				
<b>ADDITIONAL INFORMATION</b>				
<ol style="list-style-type: none"> <li>1. All the students are expected to attend all the classes and Tests without fail.</li> <li>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.</li> <li>3. Students absenting from cycle tests, on genuine reason, may appear for retest only once.</li> <li>4. Dishonesty will be penalized severely.</li> </ol>				
<b>5. The passing minimum will be fixed as per the Rules and Regulations of the</b>				

<b>Institute.</b>		
<b>FOR APPROVAL</b>		
 <b>Dr K MUTHUKUMAR</b> Course Faculty	 <b>Dr S SARAVANAN</b> CC-Chairperson	 <b>Dr P SIVASHANMUGAM</b> 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.