

**NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI**

This course outline template acts as a guide for writing your course outline. As every course is different, please feel free to amend the template/ format to suit your requirements.

<b>COURSE OUTLINE TEMPLATE</b>			
<b>Course Title</b>	<b>Introduction to Mechanical Engineering</b>		
<b>Course Code</b>	CLPC13	<b>No. of Credits</b>	3
<b>Department</b>	Chemical Engineering	<b>Faculty</b>	Srinath. A
<b>Pre-requisites Course Code</b>	A basic knowledge in Engineering physics, Mathematics I & Mathematics II is required.		
<b>Course Coordinator(s) (if, applicable)</b>	NIL		
<b>Other Course Teacher(s)/Tutor(s) E-mail</b>	NIL	<b>Telephone No.</b>	09677576869
<b>Course Type</b>	<b>Core course</b>		
<b>COURSE OVERVIEW</b>			
<ol style="list-style-type: none"> <li>1. This course is made up of five modules that teach fundamental skills that thermodynamics engineering.</li> <li>2. Students will learn how to analyse efficiency in thermodynamics cycles, develop to describe solutions to these problems</li> <li>3. Understand problem-solving principles using Mollier chart,</li> </ol>			
<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>	
1. Understand the conceptual laws of thermodynamics for application in thermodynamic cycles..		PO1, PO2, PO3, PO5, PO8, PO11, PO12	
2. Understand and analyze different thermodynamic cycles and calculate their thermal efficiencies.		PO1, PO2, PO3, PO5, PO8, PO9, PO11, PO12	
3. Understand the basics of boilers and perform simple calculations of boiler efficiencies		PO1, PO2, PO3, PO5, PO6, PO8, PO11, PO12	

4. Understand the steam distribution and utilization systems to identify the energy conservation opportunities.	PO1, PO2, PO3, PO5, PO8, PO11, PO12
5. Comprehend principles of steam turbines and calculation of turbine efficiencies; understand the basics of vacuum pumps and instruments for measurement of vacuum.	PO1, PO2, PO3, PO5, PO6, PO8, PO10, PO11, PO12

**COURSE TEACHING AND LEARNING ACTIVITIES**

S.No.	Week	Topic	Mode of Delivery
1	Week - 1	Introduction about Course (Introduction to Mechanical Engineering.), Thermodynamic systems -closed, open and isolated. Property, state, path and process.	Chalk & Talk – (Black Board) BB, PPT
2	Week – 2	quasi-static process, work, Energy, Zeroth, First and Second laws of Thermodynamics (Basic concepts only),	Chalk & Talk – (Black Board) BB, PPT
3	Week – 3	Internal energy, Specific heat capacity and Enthalpy, Thermodynamic Cycles in Air standard Cycles:, Thermodynamic Cycles in Carnot Cycle,	Chalk & Talk – (Black Board) BB, PPT
4	Week – 4	Thermodynamic Cycles in Otto Cycle, Diesel Cycle, Combined Cycle,	Chalk & Talk – (Black Board) BB, PPT
5	Week – 5	Brayton and Rankine cycles, Determination of cycle efficiency. Boilers: Types and classification of boilers, water tube, fire tube,	Chalk & Talk – (Black Board) BB, PPT
6	Week – 6	Coal, oil and gas fired boilers:, Stoker fired boilers., Pulverized bed boilers.,	Chalk & Talk – (Black Board) BB, PPT
7	Week – 7	Fluidized bed boilers, Mountings and accessories., Performance and efficiency calculation of boilers.,	Chalk & Talk – (Black Board) BB, PPT
8	Week – 8	Properties of Steam, Mollier chart,	Chalk & Talk – (Black Board) BB, PPT
9	Week – 9	Determination of dryness fraction of steam, Different types of calorimeters,	Chalk & Talk – (Black Board) BB, PPT
10	Week – 10	Concept of Steam distribution systems, Steam traps- types and their characteristics,	Chalk & Talk – (Black Board) BB, PPT
11	Week – 11	Energy conservation opportunities in steam systems, Turbines and Vacuum Systems:,,	Chalk & Talk – (Black Board) BB, PPT
12	Week – 12	Steam turbines- types and principles:, Reaction and impulse turbines;,,	Chalk & Talk – (Black Board) BB, PPT

13	Week – 13	Application of co-generation principles in process industries	Chalk & Talk – (Black Board) BB, PPT
14	Week – 14	Production of Vacuum, Systems and Equipment - Vacuum Pumps, Steam Ejectors;	Chalk & Talk – (Black Board) BB, PPT
15	Week – 15	Instrumental methods of Vacuum measurement	Chalk & Talk – (Black Board) BB, PPT

**COURSE ASSESSMENT METHODS**

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Cycle Test - I	Week 7 / 22-08-2017	1 hour	20%
2	Cycle Test - II	Week 13 / 03-10-2017	1 hour	20%
3	Retest	Week 17 / 30-10-2017	1 hour	20%
4	Assignments	---	2 week for each assignment	10%
5	End Semester Exam	Week 19 / 13-11-2017	3 hours	50% (Total = 100%)

**ESSENTIAL READINGS : Textbooks, reference books Website addresses, journals, etc**

**REFERENCE BOOKS**

1	Rajput R.K., "Thermal Engineering", 9th Edition, Laxmi Publications, 2010.
2	. Rudramoorthy R., "Thermal Engineering", 4th Edition, Tata McGraw Hill Publishing Company, New Delhi, 2006.
3	Kothandaraman, C.P., "Course in Thermodynamics and Heat Engines: Thermal Engineering with Introduction to Solar Energy ", 3rd Edition, Dhanpat Rai Publisher, New Delhi, 1985.
4	Ballaney P.L., "Thermal Engineering", Khanna Publishers, New Delhi, 2005.

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**COURSE EXIT SURVEY (mention the ways in which the feedback about the course is assessed and indicate the attainment also)**

1	Feedback from students during class committee meeting.
2	Anonymous feedback through questionnaire.

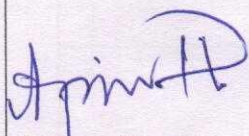
**COURSE POLICY (including plagiarism, academic honesty, attendance, etc.)**

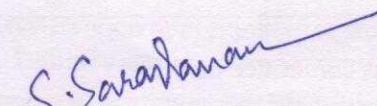
1	Cycle Test – I and Cycle Test - II will be conducted in regular class.
2	Portions for Cycle Test - I are Unit – I and Unit – II (1st and 2nd paragraph of the syllabus.)
3	Portions for Cycle Test - II are Unit – III and Unit – IV (3rd and 4th paragraph of the syllabus.)
4	Student who have missed the first or second or both the cycle test (s) can register with the concerned faculty for the RE – TEST Exam which shall be conducted soon after the second cycle test, but before the End semester examination. The weight age for Retest is 20 % and time duration is 1 hour. The portions for Retest include both cycle test(s) portions.
5	75% Attendance is compulsory for writing the End Semester Examination.
6	Mandatory classes (after the semester examinations of the current session) should be attended by the students, whose attendance falls below 75% but above 50 % in the subjected concerned.
7	Students who have less than 50 % of attendance have to redo subject CLPC13.
8	Students who have failed in the semester examination with F grade, those completed mandatory classes and those have missed the end semester examination shall take reassessment (supplementary examination).
9	The passing minimum should be $X_{avg} / 2$ or $X_{max} / 3$ , whichever is less where $X_{avg}$ is the mean of the class and $X_{max}$ is the maximum marks in the class.

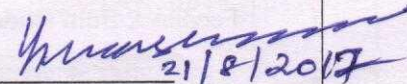
**ADDITIONAL COURSE INFORMATION**

Faculty is available for discussion after the class hours in the Department of Chemical Engineering at Room No. 106 and can also be contacted through cell no. 9677576869. Queries may also be email – id to the course faculty directly at [srinath@nitt.edu](mailto:srinath@nitt.edu)

**FOR SENATE'S CONSIDERATION**

  
Course Faculty \_\_\_\_\_

  
CC-Chairperson \_\_\_\_\_

HOD   
21/8/2017