

Department of Production Engineering
NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

PRPC15: THERMAL ENGINEERING - COURSE OUTLINE			
Course Title	Thermal Engineering		
Course Code	PRPC15	No. of Credits	03
Department	Mechanical Engineering	Faculty	Dr. R. Anand
Pre-requisites Course Code	CH 101 Chemistry — I, PH 102(B)		
E-mail	anandachu@nitt.edu	Telephone No	0431-2503423
Course Type	<input checked="" type="checkbox"/>	Core Course	<input type="checkbox"/> Elective Course
COURSE OVERVIEW			
<p>This course provides an introduction to the most powerful engineering principles of thermodynamics - transferring energy from one place or form to another place or form and its effect on the various system/devices and the surroundings. The course familiarizes the students should apply basics laws of Thermodynamics and concept of entropy in various thermodynamic application areas like steam power cycles. air standard cycles, air conditioning and refrigeration and IC engines and compressors in an exciting manner.</p>			
COURSE OBJECTIVE			
<ol style="list-style-type: none"> 1. To be able to use the First Law and second Law of Thermodynamics to estimate the potential for conversion in various thermodynamics applications 2. To provide knowledge on analysis of air standard cycle applied in internal combustion engines. 3. To discuss about principles of gas dynamics and jet propulsion 4. To enlighten the basic concepts of vapor and gas power cycles 5. To provide knowledge on analysis various refrigeration cycles and apply psychometrics for various A/C processes 			
COURSE OUTCOMES (CO)			
After taking this course students will be able to:		Aligned Programme Outcomes (PO)	
1. Analysis first law and second law of the thermodynamics applied in various systems.		1, 2, 5, 6, 8,9 and 12	

2. Demonstrate the constructional details of IC engines and analysis of air standard cycles and their applications in to IC engines	1, 2, 5, 6, 8,9 and 12
3. Assess the performance of air compressors with extensive knowledge acquired on working of compressors. Analysis the steam power cycle and identify the performance improvement in this cycle.	1. 2, 5, 6. 12
4. Understanding concepts associated with Gas dynamics and Jet propulsion	2. 3,4, 5, 6, 8,9, 11, 12
5. Assess the air quality by using psychometric chart and Analyze the refrigeration cycle	2, 3,4, 5, 6, 8,9, 11, 12

COURSE TEACHING AND LEARNING ACTIVITIES

SI. No.	Week	Topic	Mode of Delivery
01	1 st week	Laws of Thermodynamics-Basic concepts - first law of thermodynamics applied to closed and open systems.	Lecture C & T
02	2 nd week	Problems-First law of thermodynamics applied to closed and open systems Problems, Second law of thermodynamics	Lecture C & T
03	3 rd week	Concept of reversible process, Air standard cycles - Otto, diesel and dual cycles	Lecture C & T; PPT
04	4 th week	Problems- Air standard cycles - Otto, diesel and dual cycles problems, I.C. engines - S.I. engines and CI engines	Lecture C & T,PPT
05	5 th week	Reciprocating compressor - effect of clearance volume, single and multistage compressor - Volumetric efficiency - calculation of power requirement	Lecture C & T
06	6 th week	Reciprocating compressor Problems, gas turbines - open and closed cycle - intercooling	Lecture C & T,PPT
07	7 th week	Gas turbines Problems, reheating and regenerative cycles and problem solving.	Lecture C & T,PPT
		Cycle Test - 1	
08	8 th week	Wankel engine-Sonic velocity, Mach no. Wave propagation - Mach cone, static and stagnation property relations, Isotropic flow,	Lecture C & T
09	9 th week	Use of gas tables, normal shock, flow through converging and diverging nozzle, Problem Solving in Gas Dynamics and Jet Propulsion	Lecture C & T,PPT

10	10 th week	Problem Solving in Gas Dynamics and Jet Propulsion	Lecture C & T
11	11 th week	Properties of steam: P – V, T - S and H - S diagrams-Rankine cycle, modifications to improve thermal efficiency	Lecture C & T; PPT
12	12 th week	Problem solving in Rankine Cycle, Psychrometrics - various A/C processes - systems - refrigeration - Bell coleman and vapor compression cycles - vapor absorption cycle.	Lecture C & T,PPT
		Cycle Test - 2	
13	13 th week	Problem Solving on Refrigeration and Air Conditioning	Lecture C & T

COURSE ASSESSMENT METHODS

Sl. No.	Mode of Assessment	Week/Date	Duration	% Weightage
1.	Cycle Test - 1	After 7th week	60 Minutes	20
2.	Cycle Test - 2	After 12th week	60 Minutes	20
3.	Mini Project	2 nd week to -13 th week	10 weeks	30
4.	End Semester Examination	-	150 Minutes	30

Textbooks, Reference books Website addresses, Journals, etc.

1. Sonntag, R.E., and Borgnakke, C, Fundamentals of Thermodynamics, 7th ed., John Wiley, 2009
2. Nag, P.K., Engineering Thermodynamics, 3rd ed., Tata McGraw-Hill, 2005
3. Ballaney. P.L.. "Thermal Engineering", Khanna Publishers, New Delhi, 2000.
4. Ganesan, V.. "Internal Combustion Engines", Third Edition, Tata McGraw-Hill, New Delhi, 2010.
5. Roy, J. Dossat., "Principles of Refrigeration". Wiley Eastern Ltd.. New Delhi, 2000.

COURSE EXIT SURVEY

1. Feedback from the students during class committee meeting.
2. End semester feedback on Course Outcomes.

COURSE POLICY (Attendance, Assessment, academic honesty, etc.) CORRESPONDENCE

All the correspondence (schedule of classes/schedule of assessment/ course material/ any other information regarding this course) will be done through their class representative.

ATTENDANCE

1. 75% attendance is essential to appear for the end semester examination
2. A student having attendance in the range of 50-75% need to appear for the compensation assessment (CPA). Student who scores more than 60% marks in CPA along with assessment criteria will be eligible for attending the end semester examination.
3. Student not having 50% attendance at the end of the semester will have to REDO the course.

ASSESSMENT

1. If any student is not able to attend any one or both of the continuous assessment (Cycle Test I & II) due to genuine reasons, the student is permitted to appear for a Compensation Assessment (CPA) with % weightage equal to 20% (This is not valid for students who have attendance lag). At any case, CPA will not be considered as an improvement test.
2. Finally, every student is expected to score minimum 33.33% of the maximum mark of the class in the total assessment (1, 2, 3 &4) to pass the course. Otherwise the student would be declared fail and F grade will be awarded.

ACADEMIC HONESTY & PLAGIARISM

1. All the students are expected to be genuine during the course work. Acquiring information by wrong means like looking or attempting to look at another student's paper or bringing and using study material any form for copying during any assessment is considered dishonest.
2. Tendering of information such as giving one's program and mini project work to another student to use or copy is also considered dishonest.
3. Any practice which is considered dishonest during any assessment will lead to cancellation of the assessment process for the candidate.


ADDITIONAL COURSE INFORMATION

The course coordinator is available for consultation at times those are displayed on the coordinator's office notice board. Queries may also be emailed to the course coordinator directly at anandachu@nitt.edu

FOR SENATE'S CONSIDERATION

Anand 10/7/17
Course Faculty


CC-Chairperson


HOD