DEPARTMENT OF MECHANICAL ENGINEERING

NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

COURSE PLAN – PART I					
Course Title	THERMAL ENGINEERING				
Course Code	MEPC16		**No. of Credits**	3	
Course Code of Pre-requisite subject(s)	MEPC11				
Session	January 2018		**Section (if, applicable)**	B	
Name of Faculty	Dr. R. Anand		**Department**	Mechanical	
Email	anandachu@nitt.edu		**Telephone No.**	0431-2503423/3438 9444838909	
Name of Course Coordinator(s) (if, applicable)					
E-mail			**Telephone No.**		
Course Type	✓	**Core Course**	☐	**Elective Course**	

Syllabus (approved in BoS)

Classification of IC engines – Working of two and four stroke engines – valve and port timing diagrams – Deviation of engine indicator diagram from air standard cycles – Comparison of air standard and fuel air cycles – Losses in actual cycles – Comparison of Otto and diesel cycle – performance test on IC engines – heat balance test for IC engines.

Fuel supply system – Simple and complete Carburettor – Diesel pump and injector system – MPFI – CRDI – Cooling, Lubrication, Ignition systems.– Fuels for IC engines – Stoichiometric air – Ignition temperature – Ignition lag – Normal combustion in SI engines – Engine knock – effect of variables on tendency to knock – Octane Number – Pre - ignition – Normal combustion in CI engines – Diesel knock – Cetane Number – IC Engine Emission and Air pollution – Catalytic converters and EGR – Combustion chamber and types.

Classification of boilers – sub critical and supercritical boilers – Impulse and Reaction principles – compounding – velocity diagram for simple and multi stage turbines, speed regulations – Governors – Flow of steam through nozzles – shapes of nozzles – effect of friction – critical pressure ratio – supersaturated flow.

Reciprocating air compressors – types – construction – work of compression without clearance – effect of clearance – Multi staging – optimum intermediate pressure for perfect inter cooling – Compressor efficiencies and mean effective pressure.

Refrigerants – Vapour compression refrigeration cycle – super heat, sub cooling – Performance calculations – working principle of vapour absorption system, Ammonia – Water, Lithium bromide – water systems (Description only) – Air conditioning system –Types and Working principles Concept of RSHF, GSHF, ESHF – Cooling Load calculations.

COURSE OBJECTIVES
1. To familiarize with the types of working principle of two stroke and four stroke engines. 2. To understand the various parameters involved in engine combustion and its significance 3. To provide knowledge on various steam power equipment and its performance measurements 4. To impart skills to analyse air Compressor system and components 5. To acquire knowledge about analysis the vapour power system and refrigeration system

COURSE OUTCOMES (CO)

Course Outcomes	Aligned Programme Outcomes (PO)
1. Apply principles of Air standard cycle to improve the performance of energy conversion devices.	1, 2, 4, 5, 7, 8, 11, 12
2. Identify the Engine Emissions and select suitable Emission control methods for Real time.	2, 3, 4, 6, 7, 8, 11
3. Perform tests on steam power thermal devices as per standards and interpret results.	1, 2, 3, 4, 5, 7, 10, 11
4. Analyse the performance of Air compressor and select suitable intercooling system.	3, 4, 5, 6, 7, 9, 10
5. Appraise the refrigeration cycles and perform cooling load calculations for air - conditioning system	2, 3, 4, 6, 7, 10, 11

COURSE PLAN – PART II

COURSE OVERVIEW

This course studies the fundamentals of how the design and operation of reciprocating and internal combustion engines affect their performance, operation, fuel requirements, and environmental impact. Topics include fluid flow, thermodynamics, combustion, heat transfer and friction phenomena, and fuel properties, with reference to engine power, efficiency, and emissions. Students examine the design features and operating characteristics of different types of internal combustion engines: spark-ignition, diesel, stratified-charge, and mixed-cycle engines. Class includes lab project in the Engine Laboratory.

COURSE TEACHING AND LEARNING ACTIVITIES

S.No.	Week/Contact Hours	Topic	Mode of Delivery
1	1st week	Working of two and four stroke engines - valve and port timing diagrams - Deviation of engine indicator diagram from air standard cycles	C, T & PPT
2	2nd week	Fuel air cycles and their analysis, Comparison of air standard and fuel air cycles - Losses in actual cycles.	C, T & PPT
3	3rd week	I.C. engines fuels and rating -SI engine air fuel mixture requirements -Performance curve of an automobile carburetor	C & T
4	4th week	Introduction to petrol injection. Diesel injection systems -types	C & T

5	5th week	Battery Ignition - magneto ignition and transistorized coil ignition and Fuels for IC engine	C, T & PPT
6	6th week	Combustion in SI engines – Knock in SI engines effect of engine variable on knock	C & T
7	7th week	Combustion in CI engines – knock in CI Engines – combustion chambers for SI and CI engines.	C & T
8	8th week	Introduction to boilers sub critical and supercritical boilers.	C & T
9	9th week	Impulse and Reaction turbine – velocity compounding and multi stage turbine	C & T
10	10th week	Governors and flow through nozzles – Effect of friction and critical pressure - supersaturated flow	C & T
11	11th week	Introduction to refrigeration cycle – types – working principle and performance calculation	C, T & PPT
12	12th week	Vapour absorption system, Ammonia – Water, Lithium bromide – water systems	C & T
13	13th week	Air conditioning system –Types and Working principles Concept of RSHF, GSHF, ESHF – Cooling Load calculations	C & T

COURSE ASSESSMENT METHODS

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Cycle Test - 1	After 7th week	60 Minutes	20
2	Cycle Test - 2	After 13th week	60 Minutes	20
3	Project work	April Second week	3 Months	30
CPA	Compensation Assessment	April Third week	60 Minutes	20
4	Final Assessment	April Last week	150 Minutes	30

COURSE EXIT SURVEY

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

COURSE POLICY

MODE OF CORRESPONDENCE

All the communication to the class (schedule of assessment/ course material/ any other information regarding this course) will be through the class representative.

ATTENDENCE

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 the CPA along with assessment criteria will be eligible for attending the end semester examination.
3. Students not having 50% attendance at the end of the semester will have to REDO the course

COMENSATION ASSESSMENT

1. If any student is not able to attend any one or both of the Continuous Assessments (Cycle Tests I & II) due to genuine reasons, he 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 copying simulations, assignments. Looking or attempting to look at another student's paper or bringing and using study material in any form for copying during any assessment is considered dishonest.
2. Tendering of information such as giving one's program, simulation work, assignments 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 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 APPROVAL

Course Faculty _____ **CC-Chairperson** _____ 25/1/18 **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. This is not applicable for project work/industrial lectures/internship.**
d) The policy for attendance for the course should be clearly specified.
e) Necessary care shall be taken to ensure that the course plan is reasonable and is objective.