

DEPARTMENT OF MECHANICAL ENGINEERING
NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

COURSE PLAN – PART I			
Name of the programme and specialization	B.Tech / Mechanical Engineering		
Course Title	ADVANCED IC ENGINES		
Course Code	MEPE12	No. of Credits	3
Course Code of Pre-requisite subject(s)	MEPC16 – Thermal Engineering		
Session	July 2018	Section (if, applicable)	A & B
Name of Faculty	Dr. S Vedharaj	Department	Mechanical Engineering
Email	vedha@nitt.edu	Telephone No.	
Name of Course Coordinator(s) (if, applicable)			
E-mail		Telephone No.	
Course Type	<input type="checkbox"/> Core course <input checked="" type="checkbox"/> Elective course		
Syllabus (approved in BoS)			
<p>Engine design parameters, properties of working fluids.</p> <p>Analysis of engine cycles, fuel intake systems.</p> <p>Combustion in SI and CI engines.</p> <p>Pollutant formation and control in IC engines.</p> <p>Engine performance and modeling.</p> <p>Reference Books:</p> <ol style="list-style-type: none"> 1. Heywood, J.B., Internal Combustion Engine Fundamentals, McGraw-Hill, 1988. 2. Taylor, C.P., The Internal Combustion Engines in Theory and Practice, Vol. II, MIT Press, 1985. 3. Ganesan, V., Internal Combustion Engines, 2nd ed., Tata McGraw-Hill, 2003. 			
COURSE OBJECTIVES			
<ul style="list-style-type: none"> ➤ Learn to classify different types of internal combustion engines and their applications. ➤ Apply principles of thermodynamics, fluid mechanics, and heat transfer to the design and analysis of engines and engine components. ➤ Become aware of the relevance of environmental and social issues on the design process of internal combustion engines. 			

<ul style="list-style-type: none"> ➤ Develop mathematical methods for designing components and systems ➤ Apply numerical methods to perform design calculations. ➤ Advance proficiency in professional communications and interactions. 	
COURSE OUTCOMES (CO)	
Course Outcomes	Aligned Programme Outcomes (PO)
At the end of the course student will	
1. Differentiate the internal combustion engines based on the classification parameters.	1,2,3,5,7,8,11,12
2. Analyze the internal combustion engine cycles and performance parameters.	1,2,3,5,7,8,11,12
3. Explain the combustion characteristics of internal combustion engines and identify the abnormalities in combustion.	1,2,3,5,7,8,11,12
4. Identify the exhaust pollutants.	1,2,3,5,7,8,11,12
5. Illustrate the measuring instruments appropriately while working on internal combustion engines.	1,2,3,5,7,8,11,12

COURSE PLAN – PART II			
COURSE OVERVIEW			
COURSE TEACHING AND LEARNING ACTIVITIES			
S.No.	Week/Contact Hours	Topic	Mode of Delivery
1.	1 st Week	Introduction to IC engines – different types – need to IC engine in current scenario	Presentations
2.	2 nd Week	Engine design parameters – mean piston speed, torque & power calculations - Problems	Presentations
3.	3 rd Week	Engine Performance parameters – Mean effective pressures – Efficiencies - Problems	Presentations
4.	4 th Week	Properties of working fluids – measurement methods and standards	Presentations
5.	5 th Week	Estimation of stoichiometric condition for different fuel – Problem	Presentations

6.	6 th Week	Lambda estimation from exhaust gas analysis – Problems	Presentations
7.	7 th Week	Combustion in SI engines – combustion initiation and flame propagation – Different flame speeds	Presentations
8.	8 th Week	Combustion in CI engines – Fuel spray characteristics – Heat release analysis	Presentations
9.	9 th Week	Exhaust gas formation in SI & CI engines – NO _x , UHC, CO & Soot emission	Presentations
10.	10 th Week	Exhaust control strategies – DOC, DPF, SCR & 3 way Catalyst	Presentations
11.	11 th Week	Measurement devices in engine testing – Dynamometers, crank angle encoders – pressure transducers – knock sensors	Presentations
12.	12 th Week	Exhaust measurements – NDIR, chemiluminescence & flame ionization detectors - Smoke numbers	Presentations
13.	13 th Week	Introduction to new combustion concepts – current developments and achievements	Presentations
14.	14 th Week	New combustion concepts – HCCI, RCCI, GCI, PPC, Pre-chamber SI combustion, DCEE (8 stroke engines)	Jigsaw Method
15.	15 th Week	New combustion concepts – HCCI, RCCI, GCI, PPC, Pre-chamber SI combustion, DCEE (8 stroke engines)	Jigsaw Method

COURSE ASSESSMENT METHODS

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1.	Cycle test 1	8th Week	90 minutes	10%
2.	Cycle test 2	16th Week	90 minutes	10%
3.	Quiz (Multiple Choice Questions)	12th Week	15 minutes	10%
4.	Assignments	16th Week		20%
5.	End Semester	12 – 22 Nov 2018	180 minutes	50%

COURSE EXIT SURVEY

- Students feedback in the class after every 4 weeks and also through class committee meetings.
- Feedback from students on the course outcomes shall be obtained at the end of the course.

COURSE POLICY

MODE OF CORRESPONDENCE (email/ phone etc)

- All the communication (schedule of assessment/ course material/any other information regarding this course) will be intimated through the class representative.
- The Faculty is available for consultation after contact hours with prior appointment through email: vedha@nitt.edu

COMPENSATION ASSESSMENT POLICY

- Attending all the assessments (1, 2, 3, 4, 5) are mandatory for every student. Flexibility is given to the students to fix the date for each mode of evaluation convenient to majority of the students.
- If any student fails to attend the cycle test 1 and 2 due to genuine reason like medical emergency, the student may be permitted to appear for the compensation assessment (CPA) on submission of appropriate documents as proof. (Not valid for students having attendance lag).
- Students not having 75 % minimum attendance at the end of the semester and also didn't attend cycle test 1 and 2 will be awarded 'V' Grade and have to REDO the course.
- In any case, compensation assessment (CPA) is not considered as an improvement test.
- The minimum marks for passing this course and grading pattern will adhere to the regulations of the institute.

ATTENDANCE POLICY (A uniform attendance policy as specified below shall be followed)

- All the students are expected to attend all the contact hours. Students should maintain 75% minimum physical attendance by the end of the course to attend the end semester examination.
- Absence due to medical reason and institutional activities will be considered when the student falls below 75% of physical attendance and it should be supported by a letter (in professional letterhead) from the concerned authorities. Any preparatory works in view of institution activities should not be taken up in class contact hours.
- Students not having 75% minimum attendance at the end of the semester will be awarded 'V' Grade and have to REDO the course.

ACADEMIC DISHONESTY & 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 including the course 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 above policy against academic dishonesty shall be applicable for all the programmes.

FOR APPROVAL



Dr. S. Vedharaj (AP/ME)
Course Faculty



CC-Chairperson



HOD (ME)

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. Details of compensation assessment to be specified by faculty.**
- d) **The passing minimum shall be as per the regulations.**
- 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.