

Name of Faculty	:	Faculty of Engineering & Technology
Name of Program	:	Master of Technology (M. Tech)
Course Code	:	1MTE05
Course Title	:	Advanced I C Engine & Alternate Fuels
Type of Course	:	PE
Year of Introduction	:	2023-24

Prerequisite	:	Basic about Thermodynamics cycle
Course Objective	:	To give an overview of internal combustion engines, their classification ,application, operation , and processes.
Course Outcomes	:	At the end of this course, students will be able to:
	CO1	Understand the operating characteristics of IC engines.
	CO2	Perform a thermodynamic analysis of IC engine cycles.
	CO3	Perform a combustion analysis of IC engines.
	CO4	Understand the generation of undesirable exhaust emissions and ways to reduce them
CO5	Understand the various heat transfer mechanisms in the engine	

Teaching and Examination Scheme

Teaching Scheme (Contact Hours)			Credits	Examination Marks				
L	T	P		SEE	CIA	SEE	CIA	Total Marks
03	00	02	04	70	30	30	20	

Legends: **L**-Lecture; **T**-Tutorial/Teacher Guided Theory Practice; **P** - Practical, **C** - Credit, **SEE** - Semester End Examination, **CIA** - Continuous Internal Assessment (It consists of Assignments/Seminars/Presentations/MCQ Tests, etc.))

Course Content

Unit No.	Topics	Teaching Hours	Weightage
1	Engine Design and Operating Parameters: Engine operating cycles, spark ignition engine operation, compression ignition engine operation, geometrical properties of reciprocating engine, brake torque and power, mechanical efficiency, mean effective pressure, specific fuel consumption, air/fuel and fuel/air ratio, specific emission and emission index, engine design and performance data	3	5%
2	Combustion:	5	15%

	Combustion in SI engine with homogeneous air –fuel mixture, ignition and flame development, flame propagation and termination in SI engines, octane number, MPFI, combustion in CI engines, ignition delay, cetane number, cold weather problems, fuel spray structure, spray penetration and evaporation		
3	Alternate Fuels for IC Engines: Fuels and their properties : hydrogen, bio gas, alcohols, producer gas, LPG, CNG, non edible vegetable oils, nonedible wild oil, NH ₃ as substitute fuel for SI and CI engine, fuel additives, pros and cons of alternate fuels, biodiesel processing and production, fuels rating, coal gasification & liquefaction	4	15%
3	Measurements and Testing of IC Engines: Measurement of friction power, indicated power, brake power, fuel consumption, air consumption, emission, noise, endurance test of IC engines as per Indian standards	4	25%
4	Heat Transfer, Friction and Lubrication in IC Engines: Convective and radiative heat transfer, thermal loading on components, friction fundamentals, engine friction components, lubricant requirement, lubrication system	4	25%
5	Recent Developments in IC Engines: PIV in turbulence measurement, optical methods for flame velocity measurement, new materials for engine components, improved two stroke engines, hybrid engines and vehicles, lean burn engines, stratified charge engines, HCCI engines	4	15%

NOTE: This specification table shall be treated as a general guideline for the students and the teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Suggested List of Experiments/Tutorials

Sr. No.	Name of Experiment/Tutorial	Teaching Hours
1	To perform variable speed test of a multi / single cylinder petrol / diesel engine as per IS standard and prepare the curves of (i) BP, IP, FP Vs Speed (ii) Indicated specific fuel consumption Vs Speed	02
2	To find the indicated power on multi cylinder diesel engine / petrol engine by Morse test.	02
3	To find friction power of multi cylinder diesel engine / petrol engine by Willian's line method or motoring method.	02
4	To evaluate comparative performance of CI engine operated with Diesel and Diesel/Biodiesel blend.	02
5	To study about first law analysis for steady state reacting system and combustion stoichiometric.	02
6	To prepare heat balance sheet on multi cylinder diesel engine / petrol engine.	02

7	To study the effect of A/F ratio on the performance of the two stroke single cylinder petrol engine.	02
8	To analyze the exhaust gases emission from single / multi cylinder petrol engine.	02
9	To study and draw the valve timing diagram four stroke petrol and diesel engine.	02
10	To prepare a report on Indian emission norms	02

Major Equipment/ Instruments and Software Required

Sr. No.	Name of Major Equipment/ Instruments and Software
1	Multi / single cylinder four stroke petrol engine
2	Multi / single cylinder four stroke diesel engine
3	Multi / single cylinder Two stroke petrol engine

Suggested Learning Websites

Sr. No.	Name of Website
1	https://nptel.ac.in

Reference Books

Sr. No.	Name of Reference Books
1	Internal Combustion Engine Fundamentals by John B. Heywood, McGraw Hill Education Pvt Ltd.
2	Fundamentals of Internal Combustion Engines by H N Gupta, PHI Learning
3	Internal Combustion Engine by V Ganeshan, McGraw Hill Education Pvt Ltd.
4	Internal Combustion Engine by M L Mathur and R P Sharma, DhanpatRai Publications (P) Ltd