

Revised Course Proposal
Indian Institute of Technology Mandi
Proposal for a New Course

Course Number : ME 355
Course Name : Internal Combustion Engines
Credits : 3-0-0-3
Prerequisites : IC 142: Engineering Thermodynamics
Intended for : UG (3rd and 4th Year)
Distribution : Discipline Elective for B. Tech. ME/ Open elective for other students
Semester : Odd/Even

Preamble: Internal combustion engines has dominated the last century as prime mover for surface transport and many other decentralized requirements of mechanical power (torque and speed). This power production system is very useful and robust combination of developments in the area of physics, chemical sciences, thermodynamics, combustion technology, control system etc. This course on internal combustion engines will expose the students with system level design concepts and integration of scientific developments in various fields into technological solution.

Course Modules with Quantitative Lecture Hours:

Module 1: (12 lecture hours)

Introduction: Classification of I.C. engine, Fundamental difference between S.I. and C.I. Engines, Comparison of two stroke and four stroke engines, various components and their functions, Types of efficiency, indicated and brake power, theory of carburetion, Air Standard cycles (Diesel, Otto, Dual, Stirling, Brayton) and their comparison, measurement and testing techniques. Thermodynamics of fuel-air cycles, real cycles, various losses in actual engines. Measurement of Indicated power, brake power, fuel consumption, energy balance analysis.

Module 2: (8 lecture hours)

Combustion and control: Combustion processes in SI engine and its various stages, spark ignition, normal and abnormal combustion, knock pre-ignition, combustion stages in CI engines, ignition delay, types of combustion systems, Fuel spray behaviour, Exhaust emissions, its measurement and control.

Module 3: (4 lecture hours)

Engine cooling and lubrication system: Temperature distributions of various components, heat transfer theory, parameters effecting engine heat transfer, need and type of cooling systems.

Engine Lubrication System: Frictional losses, various types of lubrication systems, lubrication of two stroke engines

Module 4: (8 lecture hours)

Fuel Injection and Ignition systems: Requirement of Air fuel mixing, fuel properties and its measurement, fuel injection system in SI engines, fuel injection system in CI engines, turbocharging, ignition systems

Module 5: (10 lecture hours)



Advances in Road Transport: Hybrid vehicles; electric vehicles; fuel cell powered vehicles; hydrogen fuelled engines; new combustion Modes for IC engines such as low temperature combustion, homogenous charge compression ignition, reactivity controlled combustion etc.

Textbooks:

- (i) V Ganesan, Internal Combustion Engines 4/E, McGraw Hill Education, 2017
- (ii) J B Heywood, Internal Combustion Engine Fundamentals 1/E, McGraw Hill, Inc. 1988.

Reference Books:

- (i) M L Sharma and M P Mathur, Internal Combustion Engines, Dhanpat Rai Publications New Delhi, 2016.
- (ii) Richard Stone, Introduction to Internal Combustion Engines, Society of Automotive Engineers, 1999.
- (iii) Paul W. Gill and James H. Smith, Fundamental of Internal Combustion Engines, 4/E, Oxford & IBH Publishing Company Pvt. Limited, 2007.

Similarity content declaration with existing courses:

Sl. No.	Course Code	Similarity Content	Approximate % of Content
1	IC 142 Engineering Thermodynamics	Thermodynamic Cycles	<5
2	ME307 Energy Conversion Devices	Introduction to IC Engines	5

Justification for new course proposal if cumulative similarity content is > 30%:

Not Applicable.

Approvals:

Other faculty interested in teaching this course: Dr. P. Anil Kishan, Dr. M Talha, Dr. Pradeep Kumar, Dr. Dhiraj V Patil, Dr. Gaurav Bhutani

Proposed by: Dr. Atul Dhar

School: School of Engineering (SE)

Signature:

Date:

Recommended / Not Recommended, with comments:

Chairman, CPC

Date: