Faculty of Engineering & Technology, SRM University, Kattankulathur – 603203
School of Mechanical Engineering

Department of Mechanical Engineering

Course plan

Course code : ME0052 Date : 15/05/2014
Course title : Internal Combustion Engines
Semester : V
Academic year / semester : 2014-'15 / Odd (June – November 2014)

Section details:

Section	Class Room no	Details of Faculty member				
		Name	Room No.	Intercom No.	e-mail id	Student contact time
MECH		Mr.V.Rajasekar	MEC107	1835	rajasekar.v@ktr.srmuniv.ac.in	Wednessday 12:45PM-1:30PM
MECH		Dr.G.Kasiraman	MEC107	1835	Kasiraman.g@ktr.srmuniv.ac.in	
MECH		Mr. G.Balaji	MEB305A	1803	balajig@ktr.srmuniv.ac.in	

Direct assessment details:

Name of assessment	Marks	Topics (Tentative)	Tentative date	Duration
Cycle test - I	10	Basic study, Desirable air-fuel ratio for starting, warm-up, acceleration, idling and normal operation. Carburetors	04-08-2014	100 minutes
Surprise test	05	Cooling system, Lubrication system	Fourth week of August	30 – 45 min
Cycle test - II	10	Engine auxillary systems, combustion in SI engines	15-09-2014	100 minutes
Model examination	20	Entire Syllabus	27-10-2014	3 hours
End semester examination	50	Entire Syllabus	NOV 2014	3 hours
Attendance	05	N/A		

		L	T	P	C
ME0052	INTERNAL COMBUSTION ENGINES	3	0	0	3
	Prerequisite				
	Nil				

Student outcomes	Program Educational Objectives			
	1. Apply / improve their knowledge in basic sciences for excelling in various disciplines of Mechanical Engineering with the emphasis on Design, Thermal and Manufacturing.	2. Enhance professional practice to meet the global standards with ethical and social responsibility.	3. Solve industrial, social, and environmental problems with modern engineering tools.	4. Develop skills to work in teams, think intellectually and pursue life-long learning.
(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability		X	X	
(e) an ability to identify, formulate, and solve engineering problems	X		X	
(j) a knowledge of contemporary issues			X	

Course designed by		Department of Mechanical Engineering									
1	Student outcome	a	B	c	D	e	f	g	h	I	j	k
				×		×					×	

2	Category	GENERAL (G)	BASIC SCIENCES (B)	ENGINEERING SCIENCES AND TECHNICAL ART (E)	PROFESSIONAL SUBJECTS (P)
					X

3	Broad area (for professional courses only, i.e 'under P' category)	Manufacturing	Design	Thermal	Genaral		
				X			

4	Course Coordinator	Mr.V.Rajasekar

ME0052 - INTERNAL COMBUSTION ENGINES

PURPOSE

On completion of this course, the students are expected to understand the fundamental principle, operation, and performance IC Engines.

INSTRUCTIONAL OBJECTIVES

The students will acquire knowledge of

1. Engine components, auxiliary systems and combustion aspects of SI and CI Engines
2. The latest developments in the field of IC engines like lean burn engines, MPFI, Catalytic converters.

BASIC STUDY **10**

Internal Combustion Engine types and classification - SI and CI engines-components, function, operation and comparison - Two-stroke and Four-stroke engines – Description, comparison. Inlet and exhaust manifolds - Basic concepts of supercharging and scavenging - Power output of different types of engines – Efficiency – Specific fuel consumption – IMEP determination – Simple calculations – Performance characteristics – Heat balance calculations- application of IC engines.

ENGINE AUXILIARY SYSTEMS **10**

Desirable air-fuel ratio for starting, warm-up, acceleration, idling and normal operation. Carburetors – Necessity and function, types. Gasoline injection system – MPFI.

Fuel injection system for diesel engines – Necessity and function, types, injection pump – Nozzle type. Basic study Lubrication system – Need, types, oil properties. Basic study of cooling system – Need, types, air and liquid cooling – Coolant and antifreeze solutions . Ignition system – Conventional and electronic types.

COMBUSTION IN SI ENGINES **8**

Initiation of combustion– Flame velocities – Normal and abnormal combustion - Knocking in combustion – Pre-ignition – Knock and engine variables – Knock reduction – Features and design consideration of combustion chamber– Stratified charge and lean burn engines.

COMBUSTION IN CI ENGINES **8**

Various stages of combustion – Vaporization of fuel drops and spray formation – Air motion – Swirl – Squish – Delay period - Diesel knock – Factors influencing diesel knock – Features and design considerations of combustion

ENGINE POLLUTION **9**

Atmospheric pollution from reciprocating engines – Formation of oxides of nitrogen, carbon monoxide, hydrocarbons, aldehydes, smoke, and particulates. Emission control techniques.

Exhaust gas analysis – Non dispersive infra red gas analyzer, gas chromatography, chemiluminescent analyser – Flame ionisation detector. Emission standards – National and international limits.

Total **45**

TEXT BOOKS

1. Ramalingam, K. K., *Internal Combustion Engines- Theory and practice*, Scitech publications India Pvt. Ltd., Chennai, 2000.
2. Ganesan, V., *Internal Combustion Engines*, Tata McGraw-Hill, New Delhi, 1994.

REFERNCE BOOKS

1. Heywood, J.B., *Internal Combustion Engine Fundamentals*, McGraw Hill International, New York, 1988.
2. Obert, E. F., *Internal Combustion Engines and Air Pollution*, Harper International Ltd., 1973.
3. Stone, R., *Introduction to Internal Combustion Engines*, Macmillan Press, 1999.
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SESSION PLAN

SESSION NO	Title / Details of the chapter	References
	BASIC STUDY	
1.	Classification of Internal combustion Engine	T_1 , chapter 1/ T_2 , chapter 1
2	S.I and C.I Engine components – materials ,	T_1 , chapter 1/ T_2 , chapter 1
3	Function and operation of Two stroke and Four stroke engines.	T_1 , chapter 1/ T_2 , chapter 1
4	Comparison of SI and CI and two stroke and four stroke engines.	T_1 , chapter 1/ T_2 , chapter 1
5	Inlet and exhaust manifold , Basic concepts of supercharging and scavenging.	T_1 , chapter 1/ T_2 , chapter 1
6	Power output of different types of engine	T_1 , chapter 1/ T_2 , chapter 1
7	Determination of IMEP, ,ISFC, BSFC and efficiency – simple calculations.	T_1 , chapter 1/ T_2 , chapter 1,17
8	Performance of Engine and Heat balance sheet	T_1 , chapter 1/ T_2 , chapter 1,17
9	Application of IC Engines	T_1 , chapter 1/ T_2 , chapter 1
	ENGINE AUXILLARY SYSTEMS	
10	Desirable air- fuel ratios for starting , warm up, acceleration, idling and normal operation	T_1, chapter 4/ T_2 , chapter 8
11	Necessity of Carburetors and their function and types	T_1, chapter 4/ T_2 , chapter 8
12	Description of construction and function of Gasoline injection system and MPFI systems	T_1, chapter 4/ T_2 , chapter 10
13	Description of construction and function of various fuel injection system for diesel engines and their	T_1, chapter 4/ T_2 , chapter 9
14	Construction and working of injection pumps, Nozzles and their types	T_1, chapter 4/ T_2 , chapter 9
15	Engine oil properties, lubrication system ,need and their types	T_1, chapter 4/ T_2 , chapter 13
16	Various methods of cooling system in IC Engine with neat sketch	T_1, chapter 4/ T_2 , chapter 14
17	study of lubrication system ,need and their types	T_1, chapter 4/ T_2 , chapter 13

18	Basic study of ignition system, need , conventional and electronic types	T_1, chapter 4/ T_2, chapter 11
	COMBUSTION IN SI ENGINES	
19	Initiation of combustion in SI engines, flame velocity.	T_1, chapter 3/ T_2, chapter 12
20	Description of normal and abnormal combustion	T_1, chapter 3/ T_2, chapter 12
21	Effect of knocking combustion	T_1, chapter 3/ T_2, chapter 12
22	Pre-Ignition , Knock and engine variables	T_1, chapter 3/ T_2, chapter 12
23	Knock reduction in I.C.Engine.	T_1, chapter 3/ T_2, chapter 12
24	Features of combustion chamber in SI engine	T_1, chapter 3/ T_2, chapter 12
25	Design of combustion chamber in SI engine	T_1, chapter 3/ T_2, chapter 12
26	Stratified charged engine.	T_1, chapter 3/ T_2, chapter 12
27	Lean burn engine	T_1, chapter 3/ T_2, chapter 12
	COMBUSTION IN CI ENGINES	
28	Combustion in CI engine,	T_1, chapter 3/ T_2, chapter 12
29	Vaporization of fuel drops and spray formation	T_1, chapter 3/ T_2, chapter 12
30	Various stages of combustion	T_1, chapter 3/ T_2, chapter 12
31	Air motion, swirl and squish	T_1, chapter 3/ T_2, chapter 12
32	Delay period and its effects	T_1, chapter 3/ T_2, chapter 12
33	Effects of diesel knock	T_1, chapter 3/ T_2, chapter 12
34	Factors influencing diesel knock	T_1, chapter 3/ T_2, chapter 12
35	Features of combustion chamber in CI engine	T_1, chapter 3/ T_2, chapter 12
36	Design consideration of combustion chamber for CI engine	T_1, chapter 3/ T_2, chapter 12
	ENGINE POLLUTION	

37	Effects of air pollution	T_1, chapter 8/ T_2, chapter 15
38	Pollution from IC engines	T_1, chapter 8/ T_2, chapter 15
39	Formation of oxides of nitrogen, CO , hydrocarbons and their effects	T_1, chapter 8/ T_2, chapter 15
40	Formation of aldehydes , smoke and their effects	T_1, chapter 8/ T_2, chapter 15
41	Particulate emission , and emission control techniques	T_1, chapter 8/ T_2, chapter 15
42	Exhaust gas analysis, non dispersive infra red gas analyzer	T_1, chapter 8/ T_2, chapter 15
43	Gas chromatography, chemiluminescent analyzer	T_1, chapter 8/ T_2, chapter 15
44	Flame ionization detector	T_1, chapter 8/ T_2, chapter 15
45	Emission standards, national and international limits	T_1, chapter 8/ T_2, chapter 15

TEXT BOOKS

3. Ramalingam, K. K., *Internal Combustion Engines- Theory and practice*, Scitech publications India Pvt. Ltd., Chennai, 2000.
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Name & Signature Faculty :

Section	Name	Signature
MECH	Mr. V. Rajasekar	V. Rajasekar
MECH	Dr. G. Kasiraman	
MECH	Mr. G. Balaji	G. Balaji

Dean/Mechanical