GUJARAT TECHNOLOGICAL UNIVERSITY

AUTOMOBILE ENGINEERING (02)
AUTOMOTIVE AND COMBUSTION ENGINE TECHNOLOGY
SUBJECT CODE: - 2180210
DEPARTMENTAL ELECTIVE -III
B.E 8TH SEMESTER

Type of Course: - Advanced Application

Pre-requisite:- Automobile engines

Rationale:
This course is in continuation to fundamentals of internal combustion engines. The course focuses at imparting knowledge and process of combustion regarding automobile engines. Students examine the combustion process and characteristics of different types of internal combustion engines: spark-ignition, diesel, stratified-charge, GDI and HCCI engines.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P	C	Theory Marks			Practical Marks			
				ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
3	1	0	4	70	20	10	30	0	20	150

CONTENT:-

S.N.	Course Content	Total Hours	% Weightage
1	**Overview of gasoline direct injection engines** Introduction, overview of direct injection gasoline engines, potential and technologies for high efficiency direct injection gasoline engine, high pressure fuel injection system, exhaust emissions and after treatment devices	6	13
2	**Stratified charge combustion in direct injection gasoline engines** Introduction, thermodynamics and combustion process, production engines with stratified gasoline direct injection	10	22
3	**Turbocharged direct injection spark ignition engine** Introduction, historical background: turbocharging for high specific output, problems and challenges associated with turbocharging spark ignition engines, advantages of combining direct injection and turbocharging in spark ignition engines, challenges of applying direct injection to a turbocharged spark ignition engine	10	22
4	**Direct injection gasoline engines with auto ignition combustion** Introduction, principle of auto ignition combustion in the gasoline engines, approaches to auto ignition combustion operation in gasoline engines, operation and control of direct injection gasoline engines with auto ignition combustion.	10	22
5	**Homogenous Charge Compression Ignition (HCCI) Engines** Introduction, HCCI combustion fundamentals, Gasoline HCCI engine, Diesel HCCI combustion engines, operational limits and emissions.	9	20
		45	100

SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Distribution of Theory Marks (%)					
R Level	U Level	A Level	N Level	E Level	C Level
15	15	25	10	5	-

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyse and E: Evaluate

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

REFERENCE BOOKS:

1. Advanced Direct Injection Combustion Engine Technologies and Development. Vol.1
2. Gasoline and gas engines by Hua Zhao
3. HCCI and CAI engines for the automotive industry by Hua Zhao
4. Internal combustion engine by v ganesan
5. Internal combustion engine by heywood

COURSE OUTCOME:

After learning the course the students should be able to:

1. Students will describe basic concepts of combustion process in diesel engine.
2. Students will describe basic concepts of combustion process in spark ignition engine.
3. Students will describe basic concepts of combustion process in HCCI engine.
4. Students will describe basic concepts of combustion process in GDI engine.
5. Students will describe and analysis effect of super charging in petrol engine.
6. Students will describe and analysis effect of stratification in engine.

Tutorial:

1. Study of combustion process of diesel engine.
2. Study of combustion process of spark ignition engine.
3. Study of Stratified charge combustion in direct injection gasoline engines.
4. Study of direct injection gasoline engines with autoignition combustion.
5. Study of Turbocharged direct injection spark ignition engine.
6. Study of Homogenous Charge Compression Ignition (HCCI) Engines.

List of Open Source Software/learning website:

1. Videos on latest combustion engines and processes

ACTIVE LEARNING ASSIGNMENTS:

Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.