

| 4061 - AUTO ENGINES – II | | | | | | | | | |
|----------------------------|-----------|---------|------------------------|--------|------------------------------|-------|---------------|----|----------|
| Teaching Schedule Per Week | | | Progressive Assessment | | Examination Schedule (Marks) | | | | |
| Lectures | Practical | Credits | | | Theory | | Practical Ex. | | Total |
| 3 | 2 | 4 | 25 | 25 | 3 Hrs. | 100 | - | | 150 |
| Pre-requisite | | Source | Semester | Theory | Test | Total | TW | PR | Gr Total |
| 4054 | | | | 75 | 25 | 100 | 50 | - | 150 |

Rationale: This course deals with the construction and working of the parts of auto engine, which are not covered under the course auto engines I. Topics dealt are Ignition system. Popularly used carburetors, supercharging and turbo charging, performance and testing of auto engines, speed governors, service ratings of lubricating oils, and the very important topic of exhaust emission control.

Care has been taken to include matters pertaining to the recent changes in the Automobile industry. Supercharging, emission control and measuring instruments have been added to make the student familiar with the modern high-tech changes taking place in the industry. Finally the knowledge of the power measurement, efficiency of the engine can be gained. All the above topics form the essentials of any auto engine study and therefore absolutely necessary for anyone pursuing the Auto. Engg. Course.

The term work consists of study topics, amply supported by practicals, which should reinforce the skill and ability of the student.

| COURSE CONTENTS | | Hrs | Mks |
|--|--|-----|-----|
| 1. INTRODUCTION | | 5 | 12 |
| Compression ratio, its effect on power and efficiency. a) Increasing compression ratio, firing order and balancing of engines, camshaft in block and OHC: a) Drive b) valve trains – types c) valve rotation d) positive valve rotator e) valve lifters – solid & hydraulic. Cylinder blocks of Aluminium and sleeveless aluminium, engine mounts, piston clearance, piston head shapes, ring groove fortification, working principle of:- Wankel engine, automotive gas turbine, electric car and hybrid car. Automobile ratings:-a) R.A.C. b) S.A.E c) DIN | | | |
| 2. IGNITION SYSTEM | | 7 | 18 |
| Requirements, battery coil ignition system, magneto and L.T. magneto ignition system, transistorised ignition system, electronic ignition system with contactless triggers, CDI ignition system, study of ignition coil, distributor, contact breaker, dwell angle, ballast resistor, spark plug, its heat range, hot and cold plugs, ignition timing a) Centrifugal & Vacuum advance control. | | | |

| | | |
|--|-----------|------------|
| 3. FUEL SYSTEM | 8 | 16 |
| Zenith, SU, Solex and Solex-Mikuni double venturi carburettor. Diesel injection timing, Mechanical and Pneumatic governors, Diesel filters, Higher & lower heating value of fuels. Bomb calorimeter. | | |
| 4. SUPERCHARGING | 4 | 8 |
| Introduction and objects, Supercharging of SI engines, Supercharging of CI engines, its effect on performance, Supercharging limits, Methods of supercharging, Blowers – Reciprocating, vane type, Roots, centrifugal compressor, Turbocharger and its operation. | | |
| 5. EXHAUST EMISSION CONTROL | 6 | 12 |
| Introduction, Controlling air fuel mixture: a) leaner air fuel mixture, b) faster warm up c) heated air system, d) faster acting choke. | | |
| Controlling the combustion process by: a) Reducing combustion chamber surface area, b) stratified charge, c) Fuel injection, d) Increasing combustion temperature, e) Exhaust gas recirculation (EGR), f) Valve overlap, g) Control of vacuum advance | | |
| Treating the exhaust gas by: a) Air injection method, b) Catalytic converters – dual bed and three- way. | | |
| 6. LUBRICATION | 8 | 14 |
| Properties of lube oils, Additives in lube oils, Sludge formation & its prevention, Classification and service ratings of oils, Oil filters – bypass type & full flow type, Crankcase ventilation, Oil pump, Relief valve, Oil cooler, Oil pressure indicator, Cause of: a) high oil consumption, b) low oil pressure. Engine main bearings, thrust bearing, bearing lubrication & bearing oil clearances. Effect of engine cylinder wear on oil control, oil consumption & replacement ring. Viscosimeters – Saybolt and Redwood. | | |
| 7. TESTING & PERFORMANCE | 10 | 20 |
| Performance parameters. Measurement of: a) Engine speed using magnetic pick-up, b) Air consumption by air box method, c) Exhaust emission by FID and NDIR Analyser, d) Smoke by Bosch Smokemeter, e) FHP by Morse test and Motoring test, f) IHP by Electronic Indicator, g) Blowby. Heat balance sheet. Numerical examples on power and performance. | | |
| Total | 48 | 100 |

PRACTICALS / LABORATORY WORK: List of the experiments:

1. Performance test on the Petrol engine with variable speed operation
2. Performance test on the Petrol engine with constant speed operation.
3. Performance test on the Petrol engine with max. torque speed characteristics.
4. Performance test on the Diesel engine with variable speed operation
5. Performance test on the Diesel engine with constant speed operation.
6. Performance test on the Diesel engine with max. torque speed characteristics.
7. Valve timing diagram, Ignition, Ignition timing.
8. Heat balance sheet for petrol and diesel engines.
9. Exhaust gas analysis:
2. Morse Test on Multi-cylinder engines.

REFERENCE BOOKS:

1. Auto engines by A. W. Judge
2. Automobile Engineering by Kirpal Singh
3. Automotive mechanics by Crouse Anglin
4. A course in internal combustion engines by M. L. Mathur & R. P. Sharma
5. Automotive Mechanics by Joseph Heitner
6. Internal combustion Engines by V. Ganesan