

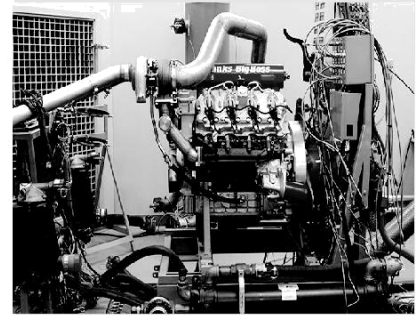
16AE401 AUTOMOTIVE FUELS, EMISSIONS AND CONTROL

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P	WA/RA	SSH/HS	CS	SA	S	BS
45	-	30	5	40	2	8	5	5



Course Description and Objectives :

This course offers fundamentals and advancements in different fuels according to their chemical structure and use with types of emissions generated and their formation mechanisms upon burning them in an internal combustion engine. The objective of this course is to provide comprehensive understanding of different driving cycles, emission standards across the world, different emissions and their measurement along with their control techniques.

Course Outcomes:

The student will be able to:

- understand different driving cycles and gain knowledge on emission standards.
- understand different pollutants, their effect on human health and environment..
- understand formation mechanisms of different pollutants from SI engines.
- understand the formation of pollutants in CI engines.
- propose different emission control techniques.
- carry out emission measurement.

SKILLS:

Identify different driving cycles and test procedures

Identify emission standards.

Characterize fuels

Use different emission measurement tools.

Propose and use an alternative fuel for a given task

ACTIVITIES:

- Perform engine emission measurements.
- Perform measurements on an engine using different fuels
- Measure different fuel properties
- Identify sources of different pollutants
- Identify sources of noise in an engine and propose its control
- Identify sources of vibration and propose its control

UNIT - 1**L-9**

INTRODUCTION : Emission - Sources of emission, Effect of pollution on human health. Emission norms: Euro and Bharat emission regulations and emission test cycles. Estimate of petroleum reserve, Need for alternate fuel, Availability and comparative properties of alternate fuels, CNG, LPG, Alcohol, Vegetable oil and Bio-gas. Alcohol - Manufacture of alcohol, Properties, Blending of Methanol and Ethanol, Engine design modifications required and effects of design Parameters, Durability. Types of vegetable oils for Engine application, Esterification, Biogas, Properties, Engine performance and emission characteristics

UNIT - 2**L-10**

POLLUTANT FORMATION IN SI ENGINES: Pollutant formation in SI engines, Mechanism of Hydrocarbon and Carbon monoxide emissions in Four stroke and Two stroke engines, Formation of Oxide of Nitrogen, Effects of Design and Operating variables on emissions formation, Control of evaporative emissions, Two stroke engine pollutants

UNIT - 3**L-9**

POLLUTANT FORMATION IN CI ENGINES: Pollutant formation in CI engines, Smoke and particulate emissions, Effect of design and operating variables on emissions formation, Formation of Oxides of Nitrogen and their control, Noise pollution, Measurement and control techniques.

UNIT - 4**L-9**

CONTROL OF EMISSIONS FROM SI AND CI ENGINES: Design of engine, Optimum selection of operating variables for control of emissions, Exhaust gas recirculation (EGR), Thermal reactors, Secondary air injection, Water injection, Catalytic converters, Catalysts, Fuel modifications, Fuel cells, Two stroke engine pollution control.

UNIT - 5**L-8**

MEASUREMENT TECHNIQUES AND TEST PROCEDURES: Non Dispersive Infrared sensor (NDIR), Flame Ionization Detector (FID), Chemiluminescent analyzer, Smoke Meters, Driving Cycles: USA, Euro, Japan and India. Test Procedures: ECE, FTP Tests, SHED Test, Chasis Dynamometers, Dillution Tunnels.

LABORATORY EXPERIMENTS**LIST OF EXPERIMENTS**

Time: 30hours

1. Properties of liquid fuels.
2. Emission measurement tests on SI and CI engines using constant volume sampling method
3. Emission measurement tests on SI and CI engines using exhaust gas analyzer.
4. Particulate emission measurement from diesel engines using smoke meter.
5. Noise measurement tests on automobile components.
6. Vibration measurement test on different components of an automobile.

TEXT BOOKS:

1. B. P. Pundir, "Engine Emissions: Pollutant Formation and Advances in Control Technology", Alpha Science International Limited, 2007.
2. Paul Degobert, "Automobiles and Pollution", Editions OPHRYS, 2007.

REFERENCE BOOKS:

1. L.K.Wang, Norman.C.Periera and Yung-Tse Hung, "Air Pollution Engineering", Springer Science Business Media, 2004.
2. Robert Hickling and Mounir M. Kamal, "Engine Noise – Excitation, Vibration and Radiation", 2nd edition., Plenum press, 1982.
3. White.R.G and Walkar.J.G, "Noise and Vibration", 4th edition, Ellis Horwood, 2000.