1154AU105 AUTOMOTIVE EMISSIONAND CONTROL

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1. Preamble

This course provides an introduction to the vehicle population growth, types of emission, formation of pollutant in SI and CI engine, effect of pollutant on human health, environment, measurement and control.

2. Pre-requisite

NIL

3. Links to other courses

- Fuel conservation & Alternate fuels
- I.C.Engines

4. Course Educational Objectives

Students undergoing this course are expected to

- To develop the basic knowledge of the students in automobile engines pollution formation & control techniques, Measurement techniques.
- Know the social, cultural, global and environmental responsibilities of the professional engineer, and the principles of sustainable design and development.

5. Course Outcomes

Upon the successful completion of the course, students will be able to

CO Nos.	Course Outcomes	Level of learning domain (Based on revised Bloom's)
CO1	Describe the emission and its effect on human health and environment.	**K2**
CO2	Identify the formation of pollutant in SI engine.	**K2**
CO3	Identify the formation of pollutant in CI engine	**K2**
CO4	Describe the Emission control techniques.	**K2**
CO5	Describe the Emission measurement techniques, Emission Standards and various test procedure	**K2**

6. Correlation of COs with Programme Outcomes :

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**H**	**H**	**H**	**L**					**H**			
CO2	**H**	**H**	**M**	**L**					**H**			
CO3	**H**	**H**	**H**	**L**					**H**			
CO4	**H**	**H**	**H**	**L**					**H**			
CO5	**H**	**H**	**H**	**L**					**H**			

7. Course content

UNIT I Introduction **L-9**

Vehicle Population Assessment in Metropolitan Cities and Contribution to Pollution- Effects on Human Health and Environment- Global Warming- Types of Emission (Controlled and Uncontrolled Emissions)- Transient Operational Effects on Pollution.

UNIT II Pollutant Formation in Si Engines **L-9**

Pollutant Formation in SI Engines- Mechanism of HC and CO Formation in Four Stroke and Two Stroke SI Engines- NOx Formation in SI Engines- Effects of Design and Operating Variables on Emission Formation- Evaporative Emission. Two Stroke Engine Pollution.

UNIT III Pollutant Formation in Ci Engines **L-9**

Pollutant Formation in CI Engines- Smoke and Particulate Emissions in CI Engines- Effects of Design and Operating Variables on CI Engine Emissions. NOx Formation

UNIT IV Control of Emissions from Si and Ci Engines **L-9**

Design of Engine- Optimum Selection of Operating Variables for Control of Emissions- EGR- Catalytic Converters- Catalysts- Fuel Modifications- Two Stroke Engine Pollution Controls. SCR- Lean NOx Trap and DPF- PCV- Fuel Charcoal Canister.

UNIT V Measurement Techniques Emission Standards and Test Procedure **L-9**

NDIR- Fid- Chemiluminescent Analyzers- Gas Chromatograph- Smoke Meters- Emission Standards- Bs-Vi Norms- Driving Cycles – USA- Japan- Euro and India. Test Procedures – ECE- FTP tests. Shed test – Chassis Dynamometers- Dilution Tunnels.

TOTAL: 45 periods

8. Text Books

1. Paul Degobert – Automobiles and Pollution – SAE International SBN-1-56091-563-3, 1991.
2. G.P.Springer ad D.J.Patterson, Engine Emissions, Pollutant formation, Plenum Press, New York,1986.
3. D.J.Patterson and N.A.Henin, 'Emission from Combustion Engine and their control', Anna Arbor Science Publication,1985.

9. References

1. SAE Transactions- "Vehicle Emission"- 1982 (3 volumes).
2. Obert.E.F.- "Internal Combustion Engines"- 1988
3. Marco Nute- " Emissions from two stroke engines, SAE Publication – 1998
4. Ganesan .V- "Internal Combustion Engines"- Tata McGraw-Hill Co- 2003.