FACULTY OF ENGINEERING & TECHNOLOGY

Effective from Academic Batch: 2022-23

Programme: **Bachelor of Technology (Automobile Engineering)**

Semester: **VIII**

Course Code: **202010803**

Course Title: **Automotive Pollution and Control**

Course Group: **Professional Elective Course-V**

Course Objectives: This course imparts the knowledge of automotive Pollution and control. The detailed concept of formation and control techniques of pollutants like UBHC, CO, NOx, particulate matter and smoke for both SI and CI engine will be taught to the students. The instruments for measurement of pollutants and emission standards will also be introduced. At the end of the course the students will have command over automotive pollution and control.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
				Internal		External		Total
Lecture	Tutorial	Practical		Theory	J/V/P*	Theory	J/V/P*	
3	0	2	4	50 / 18	25 /9	50 / 17	25 / 9	150 / 53

* **J**: Jury; **V**: Viva; **P**: Practical

Detailed Syllabus:

Sr.	Contents	Hours
1	**Introduction to automotive pollution.** The atmosphere, Air pollutants, Pollutants produced by automobiles, Emission control norms- International & Indian norms, Noise and sound pressure, Measurement of noise, Causes of automobile noise and its reduction.	07
2	**Principle of production of exhaust gases:** Theoretical air-fuel ratio, Carbon monoxide (CO) gas, Hydro Carbon (HC) gas, Oxides of Nitrogen (NOx), Driving conditions and exhaust gases.	03

3	**Emission control systems.**	20
	Emission control components layout and drawing, Necessity and operation of Positive Crankcase Ventilation (PCV) system, Necessity and operation of fuel evaporative emission control (EVAP) system for Carburetted & MPFI engines, Operation of Charcoal Canisters, Necessity and operation of Throttle Positioner (TP) system & Throttle Positioner sensor, Catalytic converters, Oxygen (O2) sensor, Necessity and operation of High Altitude Compensation (HAC) system, Manifold Absolute Pressure Sensor (MAPS), Spark timing emission control systems, Knock (Detonation) sensor, Exhaust gas re-circulation (EGR) system, ECM controlled EGR valves, Necessity and operation of Mixture Control (MC) system.	
4	**Principle methods of exhaust gas analysis.**	08
	Measuring CO and CO2 concentrations, Measuring HC concentrations, Measuring NOx concentrations, Prevalent Automotive emission control norms in India, Construction & working of Exhaust Gas analyser, Construction & working of Diesel Smoke meter.	
5	**LPG and CNG conversion:**	07
	Describe conversion, installation & maintenance of LPG & CNG kit, Merits of LPG's., LPG conversion kit, LPG kit installation. , Maintenance of LPG kit components , Merits of CNG, CNG conversion kit., CNG kit installation, Maintenance of CNG kit components, Performance features of Petrol.	

List of Practicals / Tutorials:

1	Performance to Measure CO, HC emission from petrol engines on exhaust gas analysis.
2	Performance to Measure diesel exhaust smoke of diesel engine on diesel smoke meter.
3	Demonstration of service to positive crankcase ventilation system.
4	Demonstration of test spark timing control system.
5	Demonstration of muffler.
6	Demonstration of catalytic converter.
7	Demonstration of exhaust gas re-circulation (EGR) system.
8	Demonstration of LPG kit inspection, testing and setting.
9	Demonstration of CNG kit inspection, testing and setting.
10	Demonstration of emission control norms in India.

Reference Books:

1	Paul Degobert, Automobiles and Pollution – SAE International ISBN-1-56091-563-3,1991.
2	Anil Chhikara, Automobile Engineering, Engine System, Vol– I, Satya Prakation, New Delhi.
3	William H. Carouse, Donald L. Anglin, Automotive Mechanics Tata McGraw-Hill Co., Ltd., New Delhi.
4	William H. Carouse, Donald L. Anglina, Automotive Emission Control, Tata McGraw-Hill Co., Ltd., New Delhi.
5	Ames D. Halderman, James Linder, Automotive Fuel and Emissions Control Systems, Prentice Hall.
6	Richard K. DuPuy, Steven D. Schaefer, William E. Renke, Fuel systems and emission controls, Chek-Chart Publications.
7	Tom Denton, Automobile Electrical & Electronics System, Arnold Publishers.

Supplementary learning Material:

1	NPTEL Resources

Pedagogy:

- Direct classroom teaching
- Audio Visual presentations/demonstrations
- Assignments/Quiz
- Continuous assessment

Internal Evaluation :

The internal evaluation comprised of written exam (40% weightage) along with combination of various components such as Certification courses, Assignments, Mini Project, Simulation, Model making, Case study, Group activity, Seminar, Poster Presentation, Unit test, Quiz, Class Participation, Attendance, Achievements etc. where individual component weightage should not exceed 20%.

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks						R: Remembering; U: Understanding; A: Application, N: Analyze; E: Evaluate; C: Create
R	**U**	**A**	**N**	**E**	**C**	
25	30	30	05	05	05	

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.

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Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	Understand the pollution, its effects on human & ways to reduce pollution.	**15**
CO-2	Understand the various pollutants produced under different driving conditions.	**10**
CO-3	Understand the various system used for emission control and construction & working of different Emission control systems.	**40**
CO-4	Understand method of measuring various pollutants and automotive emission control norms in India.	**20**
CO-5	Understand Describe conversion, installation & maintenance of LPG & CNG kit.	**15**

Curriculum Revision:	
Version:	2
Drafted on (Month-Year):	June-2022
Last Reviewed on (Month-Year):	
Next Review on (Month-Year):	June-2027