TEACHING PLAN: IC ENGINES

SCHOOL: SOET	ACADEMIC SESSION 2022-23	FOR STUDENTS' BATCH: 2021-2025

1	**Course code**	PCC – ME 213
2	**Course Title**	IC ENGINES
3	**Credits**	**4**
4	**Learning Hours**	**Contact Hours: 45** **Practical Teaching: 10** **Project, Tutorial and Assessment: 15** **Total hours: 70**
5	**Course Objective**	I. To give an overview of Internal Combustion Engines, their classification, applications, air standard cycles and deviation of actual cycles. II. To give complete knowledge fuel-air cycles and deviation with actual cycles and working of 4-S and 2-S engines. III. To describe combustion phenomena in IC engines and give complete knowledge of type of fuels used in IC engines IV. To give complete the fuel supply systems V. To explain the different performance analysis of IC engines and governing methods
6	**Course Outcomes**	1. Understand different types of engines, applications, ideal cycles of operation and deviation with actual cycle and performance parameters 2. Understand fuel air cycles and deviations with actual cycles, effect of various operating variables of SI and CI engines, value timing diagrams and working of 2-s and 4-4 engines. 3. Understand combustion phenomena in SI and CI engines and combustion chamber design, Knocking phenomena, fuel additives, different types of fuels. 4. Understand fuel supply systems, cooling systems and lubrication systems. 5. Apply basic calculations of the engine on performance and understand governing methods
7	**Outline syllabus:**	

7.01	Paper Code	Unit	Introduction	Reference number	Teaching methods
7.02	PCC – ME 213	I	Introduction to IC Engines: Definition of engine, classification, Application of IC engines, Air Standard Cycle and deviation from air standard actual cycle, Indicator diagram, MEP (mean effective pressure), Shaft power, Indicated power.	T1, R1	PPT, Seminar, Chalk & Talk
7.03		II(a)	Actual working of IC engine: Introduction to fuel air cycles and their significance, Composition of cylinder gases, Variable specific heats, Comparison of air standards & fuel air cycles, Effect of operating variables- compression ratio, fuel air ratio, actual cycles and their analysis,	T1, R1	PPT, Seminar, Chalk & Talk
7.04		II (b)	Difference between actual and fuel-air cycle, actual and fuel-air cycles for S.I. and C.I. engines. Working of 4-stroke petrol & diesel engines and their valve timing diagram, working of 2-stroke petrol & diesel engines & their valve timing diagrams, Comparison of 2-stroke &4-stroke engines, Actual working of 2 & 4 stroke gas engines and their valve diagram.	T1, R1	PPT, Seminar, Chalk & Talk
		III	Fuel and Combustion: Fuels for SI and CI engine, Important qualities of SI and CI engines fuels, rating of SI engines, CI engines fuels, Dopes, Combustion in CI engines, Ignition delay,	T1,R2, R3	PPT, Seminar, Chalk

			Knocking phenomena and its control, Combustion chamber design for CI engines. Combustion in SI engine, Detonation, Additives, Gaseous fuels, LPG, CNG, Biogas, Producer gas and Alternatives fuels for IC engines.		&Talk
7.05		IV	Fuel Supply System: Fuel supply system and fuel pumps, Properties of air fuel mixture, Carburettor and its working, Actual air fuel ratio of single jet carburettor, Supercharger, Petrol injection, Fuel injection systems for C.I., Cooling and lubricants of IC engines Classification of injection systems, Injection pump, Fuel injection systems, Fuel Injector, Nozzle, Injection of S.I. Engines and Fuel filters.	T1, R1,R2	PPT, Seminar, Chalk & Talk
		V	Measurement and Testing: Measurement of shaft power, Indicated power, Measurement of speed, Air consumption, Fuel consumption, Heat carried by cooling water, Heat carried by the exhaust gases, Morse test,Heat balance sheet, Governing of I.C. Engines, Performance characteristics of I.C. Engines, Performance parameters, Performance of S.I. Engines, Performance of C.I. Engine	T1, R1,R3	PPT, Seminar, Chalk & Talk

8	**Course Evaluation**	
8.10	**CA: 20%**	
8.1	**Attendance**	5%
8.12	**Homework**	-
8.13	**Quizzes**	4 Quizzes, 5%
8.14	**Projects**	1 Project, 5%
8.15	**Presentation**	1 Presentation, 5%
8.16	**Any other**	--
8.2	**MTE(IA)**	20%
8.3	**End-term examination: 60%**	
9	**Text Books & References**	
9.1	**Text books**	1. I.C.Engines/V.GANESAN-TMH
9.2	**References**	1. A Course in Internal Combustion Engines / Damukundwar - DhanpathRai& Sons 2. Internal Combustion Engine Fundamentals / Heywood J.B. – TMH 3. Engineering Fundamentals of Internal Combustion Engines / Willard W. Pulkrabek 4. https://nptel.ac.in/courses/112103262 5. https://nptel.ac.in/courses/112104033
9.3	**Video References**	1. https://www.youtube.com/watch?v=22iaJmQsvwg 2. https://www.youtube.com/watch?v=mRcFO7X8yP4 3. https://www.youtube.com/watch?v=cT9UN1XENNk 4. https://www.youtube.com/watch?v=E_fR6jOpxN4

Mapping of COs & POs

Course Outcome	Program Outcome												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	3	3	3	3	2	2	2		2	1	2	2	3	3	2	2
CO2	3	3	3	3	2	2	2		2	1	2	2	3	3	2	2
CO3	3	3	3	3	2	2	2		2	1	2	3	3	3	2	2
CO4	3	3	3	3	2	2	1		2	2	1	2	3	3	2	2
CO 5	3	3	3	3	2	2	2		1	1	1	1	3	3	2	2

QUESTION BANK

UNIT I

1. What are the differences between two stroke and four stroke engines?
2. Give the classification of IC Engines.
3. Write about performance parameters of IC engine?
4. Distinguish between SI engines and CI engines?
5. List out assumptions made for air standard cycles?

UNIT II

1. Explain working of four stroke diesel engine with neat sketches.
2. What are the assumptions for fuel-air cycle analysis?
3. Discuss major deviations of actual cycle with fuel-air cycle.
4. Draw and explain valve timing diagram of four stroke petrol engine.
5. Explain working of two stroke petrol engine with neat sketch.

UNIT III

1. State and explain different combustion stages in SI engine.
2. State and explain different combustion stages in CI engine.
3. Explain knocking, properties and its effects in CI engine.
4. Explain different types of combustion chambers in SI and CI engine.
5. Explain the need for air motion and types.
6. Factors influencing knocking in SI and CI engine.
7. Differentiate between normal combustion and abnormal combustion phenomena incase of SI Engine.
8. What is the importance of variables like flame speed flame front in case of delay period.
9. Explain knocking additives.

UNIT IV

1. Discuss air flow movements in CI engines
2. Explain the Splash lubrication system with the diagram.
3. Explain the carburetor working principle with diagram.
4. What are the types of fuel injection systems? Explain anyone with a neat sketch.
5. Explain the Pressure feed system with a diagram.

UNIT V

1. Explain the Morse test.
2. What is willan's line? How do you measure frictional power using this?
3. Discuss different types of dynamometers.
4. Write short notes on Exhaust gas analysis.
5. What is the significance of heat balance sheet? Discuss the procedure to draw heat balance sheet for CI engine.
6. Define the following terms: Indicated Power, Brake power, Friction Power, Mechanical efficiency, Mean effectiveness.