APPLIED THERMODYNAMICS

Course code	20ME3403	Year	II	Semester	II
Course category	Professional Core	Branch	ME	Course Type	Theory
Credits	3	L-T-P	3-0-0	Prerequisites	Basic Thermodynamics
Continuous Internal Evaluation	30	Semester End Evaluation	70	Total Marks	100

Course outcomes: At the end of the course, the student will be able to

CO	Statement	Skill	BTL	Units
CO1	**Understand** the basic concepts of IC engines, steam, gas power cycles and their components.	Understand	L2	1,2,3,4,5
CO2	**Apply** thermodynamic principles to calculate the engine performance**.**	Apply	L3	1,2
CO3	**Apply** steam cycles for performance calculation of steam power plant.	Apply	L3	3
CO4	**Analyse** the performance of steam nozzles, condensers and gas power cycles.	Analyze	L4	4, 5

Contribution of Course outcomes towards achievement of programme outcomes & Strength of correlations (High:3, Medium: 2, Low:1)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2					2						3	
CO2	3	2					2						3	
CO3	3	2		2			2						3	2
CO4	3	2		2			2						3	2

Syllabus

Unit	Contents	COs
I	**IC Engines:** Working and classification of IC engines, comparison of two stroke and four stroke engines, comparison of SI and CI Engines. **Testing and Performance of IC Engines:** Methods of testing IC Engines, performance analysis of IC Engines.	CO1, CO2
II	**Combustion in IC Engines: SI engine**: stages of combustion, normal combustion, abnormal combustion, variables affecting delay period and knocking, pre-ignition. S**tages of combustion in CI engine**: normal combustion, abnormal combustion, variables affecting delay period and knocking. Fuel requirements and fuel rating of SI and CI engines.	CO1, CO2
III	**Vapour Power Cycles:** Vapour power cycle, simple Rankine cycle, mean temp of heat addition thermodynamic variables affecting efficiency and output of Rankine cycle. **Methods to improve thermal efficiency of Rankine cycle:** Reheating, Regeneration, Factors affecting Rankine cycle, Adiabatic flame temperature.	CO1, CO3
IV	**Steam Nozzles**: Function of a nozzle – applications – types- velocity of fluid at nozzle exit-Ideal and actual expansion in a nozzle, velocity	CO1, CO4

	coefficient, condition for maximum discharge, critical pressure ratio. **Steam Condensers:** Requirements of steam condensing plant – classification of condensers – working principle of different types – vacuum efficiency and condenser efficiency.	
V	**Gas power Cycle:** Brayton cycle, Simple gas turbine plant, closed cycle and open cycle for gas turbines, condition for maximum pressure ratio and optimum pressure ratio, actual cycle, methods to improve the performance of the cycle- Inter cooling, reheating and regeneration.	**CO1, CO4**

Learning Resource
Text books:
1 Ganesan V/ Internal Combustion Engines / Tata McGraw Hill, 2017. 2 V.P.Vasandani and D.S.Kumar / Treatise on Heat Engineering / Metropoliton book Co. Pvt. Ltd. 3 Mahesh M Rathore, Thermal Engineering, McGraw Hill Publications - 2012.
Reference books
1 Cengal Y.A and Boles M.A,Thermodynamics: AnEngineeringApproach, 5/e, McGraw-Hill, 2006. 2 Yahya,S.M.,Turbines,CompressorsandFans,4/e,TataMcGrawHill,2010. 3 Nag P.K, Engineering Thermodynamics, 4/e, Tata McGraw-Hill, 2008. 4 Onkar Singh, Thermal Turbomachines, 3/e, Wiley India, 2014. 5 P.L.Ballaney, Thermal Engineering, 2/e, Khanna, 2005.