

AEROSPACE PROPULSION LABORATORY

VI Semester: AE								
Course Code	Category	Hours / Expt			Credits	Maximum Marks		
AAE108	Core	L	T	P	C	CIA	SEE	Total
		-	-	3	2	30	70	100
Contact Classes: Nil		Tutorial Classes: Nil		Practical Classes: 36			Total Classes: 36	
<p>COURSE OBJECTIVES: The course should enable the students to:</p> <ol style="list-style-type: none"> I. Understand the basics of propulsion, working principles of reciprocating engines, flash and fire point, and kinematic and dynamic viscosity of fuels. II. Knowledge about the mechanical efficiency of axial compressor, work, power, thrust requirements of a gas turbine and efficiency and performance diagrams. III. Calculation of thermal, propulsive efficiency of gas turbine, work output of axial turbine and nozzle performance. IV. Understand the calorific values of different fuels, coefficient of convection heat transfer, and calculation of propeller efficiency. <p>COURSE OUTCOMES (COs):</p> <p>CO 1: Understand the working mechanism and identifying various components to build an IC engine flash point, fire point and kinematic viscosity and dynamic viscosity of given oils.</p> <p>CO 2: Able to calculate the mechanical efficiency of axial compressor, efficiency and performance parameters of a gas turbine.</p> <p>CO 3: Understand the concepts in estimating the gas turbine efficiency, work output of axial turbine and nozzle performance.</p> <p>CO 4: Analyse the calorific value of different fuels, estimation of convection heat coefficient of a plate and propeller efficiency using propeller test rig</p> <p>COURSE LEARNING OUTCOMES (CLOs): The students should enable to:</p> <ol style="list-style-type: none"> 1. Understand the working mechanism and identifying various components to build an IC engine. 2. Understand the importance of flash point and fire point for a given oil. 3. Explain the estimation of kinematic viscosity and dynamic viscosity of given sample. 4. Understand the calculation of mechanical efficiency of axial compressor 5. Understand the work, power and thrust requirement in gas turbine 6. Observe the gas turbine efficiency and performance diagrams 7. Determine the thermal, propulsive and overall efficiency of turbo jet cycle 8. Understand the calculation of total work output of axial turbine- out put work necessary, available output. 9. Analyze various nozzle performance with airflow. 10. Observe the calculation of calorific value of different fuels and materials. 11. Analyze the convection heat coefficient of a plate using forced jet. 12. Analyze the propeller efficiency and thrust availability using propeller test rig at various blade pitch angles. 								

LIST OF EXPERIMENTS	
Week-1	ENGINE DISASSEMBLY AND ASSEMBLY
a) To understand the working mechanism and identifying various components to build an IC engine. b) Brief description about Components of engine and their functions.	
Week-2	FLASH POINT AND FIRE POINT TEST
Determination of flash point and fire point for a sample using pen sky martin's test.	
Week-3	DETERMINATION OF DYNAMIC VISCOSITY OF A GIVEN SAMPLE USING REDWOOD VISCOMETER
a) Determine kinematic viscosity and dynamic viscosity of given sample using a viscometer. b) Order fluctuating temperature is measured in terms of viscosity	
Week-4	MECHANICAL EFFICIENCY OF AXIAL COMPRESSOR
Calculation of the Mechanical efficiency of axial compressor- power required, power Available, Compression Ratio.	
Week-5	GAS TURBINE PARAMETERS CALCULATION
Calculation of work, power and Thrust requirement in gas turbine- combustion power input, work heat relationship.	
Week-6	GAS TURBINE EFFICIENCY AND PERFORMANCE DIAGRAMS
Elucidate T-S, H-S diagrams for the gas turbine and compare efficiencies of non-ideal engine components.	
Week-7	GAS TURBINE EFFICIENCY CALCULATIONS
Calculation of thermal, propulsive and overall efficiency of turbo jet cycle.	
Week-8	WORK OUTPUT OF AXIAL TURBINE
Calculation of total work output of axial turbine- out put work necessary, Available output.	
Week-9	NOZZLE PERFORMANCE
Calculation of various nozzle performance with airflow.	
Week-10	CALORIFIC VALUE OF DIFFERENT FUELS
Calculation of calorific value of different fuels and materials using digital bomb calorimeter and optimizing astute fuels	
Week-11	FREE AND FORCED CONVECTION
Estimation of convection coefficient of air using forced jet or free convection apparatus.	
Week-12	PROPELLER TEST RIG
Calculation of propeller efficiency and thrust availability using propeller test rig at various blade pitch angles.	
Reference Books:	
<ol style="list-style-type: none"> Anderson, J.D., Jr., Computational Fluid Dynamics the Basics with Applications, McGraw-Hill Inc, 1st Edition 1998. Hoffmann, K. A. and Chiang, S. T., "Computational Fluid Dynamics for Engineers", Engineering Education Systems, 4th Edition, 2000. Hirsch, C., "Numerical Computation of Internal and External Flows: The Fundamentals of Computational Fluid Dynamics", Butterworth-Heinemann, Vol. I, 2nd Edition, 2007. 	