AMITY UNIVERSITY
UTTAR PRADESH

Course Title: PROPULSION – I

Credit Units: 05

L	T	P/ S	SW/F W	TOTAL CREDIT UNITS
3	1	2	-	5

Course Code: AERO203

Course Level: UG

Course Objective

This course is aimed at providing the students the basic knowledge and governing laws of various modes of heat transfer, aero- and thermodynamic aspects of propulsive devices, such as, propellers, piston type and turbine type aero engines, their performance parameters and the essential knowledge of fuel combustion, standard ratings of aviation fuels and propellants used in rocket engines. With this basic knowledge, the student can move on to studying the advance propulsion systems.

Pre-requisites: Thermodynamics

Course Contents/Syllabus:

	Weightage (%)
Module I : Heat Transfer	**10**
Descriptors/Topics *:* Heat transfer process, Heat conduction, thermal conductivity, general equations of heat conduction with source, conduction problems in 1D and 2D with and without source; Convective heat transfer fundamentals, Introduction to radiative heat transfer, Coupled heat transfer problems.	
Module II : Propellers	**25**
Descriptors/Topics : Ideal momentum theory and blade element theory and their relative merits, numerical problems on the performance of propellers using propeller charts, selection of propellers, fixed, variable and constant speed propellers, prop-fan, material for propellers, shrouded propellers helicopter rotor in hovering performance.	
Module III : Aircraft Piston Engines	**25**
Descriptors/Topics : Brief historical sketch of S.I. and C.I. engines, 4-stroke and 2-stroke engines, thermodynamics of engine analysis, combustion process, air standard cycles, various type of arrangements or multi-cylinder aircraft engines, their merits and operational efficiencies, intake and exhaust manifolds, cooling and lubrication systems, valve timing and arrangements, I.H.P., B.H.P and F.H.P, engine performance, effect of altitude, power required and	

power available, supercharging, preliminary design of aircraft piston engine.	
Module IV : Fuel Combustion and Flame Stability	**20**
Descriptors/Topics : Liquid fuels, hydrocarbons, gasoline, starting mixtures and temperatures, vapor lock, other liquid fuels and blends, combustion knock and knock rating, carburetion and fuel injection, ignition of the charge, ignition system, gas turbine fuels, solid and liquid propellants.	
Module V : Aircraft Gas Turbine Engines	**20**
Descriptors/Topics: Air-standard Brayton cycle, actual gas turbine engine cycle, compressor and turbine efficiencies, compressor work and turbine work, centrifugal and axial type of compressor, their comparative action, relative merits in operations, combustion chambers: various arrangements, simplex and duplex burners.	

Student Learning Outcomes:

- Define governing laws of various IC Engines, cycles and modes of heat transfer; thermodynamic aspects of aerospace propulsion systems and their performance parameters
- Describe fuel combustion and flame-stability.
- Examine and analyze compressors and turbines.
- Apply and calculate performance of various types of engines
- Describe Laws of heat transfers

Pedagogy for Course Delivery: Session Plan / course-material uploading, Class-room teaching associated with assignments**,** Propulsion Lab experiments & Report preparation, quiz, viva-voce and evaluation.

Lab/ Practical details, if applicable:

List of Experiments:

- To study the functioning of aircraft piston engines having various arrangements of cylinders.
- Study of Jet Engine.
- Experiments on Continuous Combustion test rig.
- To conduct Morse test on given multi cylinder engine.
- To conduct dynamometer test and retardation test
- Performance test on reciprocating air compressor.

Assessment/ Examination Scheme:

Theory L/T (%)	Lab/Practical/Studio (%)	Total
80	20	100

Theory Assessment (L&T):

Continuous Assessment/Internal Assessment - 30					End Term Examination
Components (Drop down)	**A**	**CT**	**S/V/Q**	**HA**	**70**
Weightage (%)	5	10	8	7	70

Lab/ Practical/ Studio Assessment:

	Continuous Assessment/Internal Assessment				End Term Examination	
Components (Drop down	**PR**	**LR**	**V**	**A**	**EXP**	**V**
Weightage (%)	10	10	5	5	35	35

Text & References:

- Holman J.P., "Heat Transfer", 2nd Ed., McGraw Hill.
- Gebhart B., "Heat Transfer", 2nd Ed., McGraw Hill.
- Dommasch, Sherby and Connolly, "Airplane Aerodynamics", Pitman.
- Litchy L.C., "I C. Engines", McGraw Hill.
- Mattingly J.D., "Elements of Gas Turbine Propulsion", McGraw Hill 1st Ed.1997.
- Cohen Rogers and Sarvanmattoo, "Gas Turbine Theory", John Wiley.
- P. G. Hill and C. R. Peterson, "Mechanics and Thermodynamics of Propulsion", Addison Wesley, 1970.
- J.L Kereebrock, "Aircraft Propulsion System Technology and Design", MIT Press, 1991.

Any other Study Material: