

COURSE CODE	COURSE TITLE	L	T	P	C
1151AE101	INTRODUCTION TO AEROSPACE ENGINEERING	2	0	0	2

Course Category:

Programme core

a. Preamble :

The course aims at introducing basic knowledge on aerospace vehicles and their configurations. The course has its emphasis on presenting the students with the concepts of atmospheric properties, principles of flight, aerodynamics, power plants, structures & materials, and flight mechanics

b. Prerequisite Courses:

- Nil

c. Related Courses:

- Aircraft Systems and Instruments
- Aircraft Rules and Regulations
- Helicopter Theory

d. Course Educational Objectives:

- To discuss in general, the aerospace history and to explain the configurations of aerospace vehicles.
- To provide a broad understanding on the concepts of Flight principles, Aerodynamics, Propulsive systems, Structures and Materials, and Flight Mechanics

e. Course Outcomes:

Upon the successful completion of the course, students will be able to:

CO Nos.	Course Outcomes	Knowledge Level (Based on revised Bloom's Taxonomy)
CO1	Tell the evolution of aerospace vehicles and identify the various components of such vehicles.	K2
CO2	Distinguish among various flight vehicle configurations and describe their features	K3
CO3	Describe the properties and structure of atmosphere, and state the aerodynamic forces and moments acting on aircraft	K2
CO4	Describe the aerodynamics of wings and aerofoils and express the performance equations	K2
CO5	Outline the various aerospace power plants and discuss the structures and materials of aerospace structures	K2

f. Correlation of COs with POs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H					H						
CO2	H					H						
CO3	H			H		H		M				
CO4	H			H		H		M				
CO5	H					H						

H- High; M-Medium; L-Low

g. Course Contents:

UNIT I - HISTORY AND FLIGHT VEHICLES COMPONENTS

L-6

Historical evolution of airplanes - Aircraft axes and attitude definitions - Different types of flight vehicles, Components and functions of an airplane and space vehicles, components of rocket and missiles. Parts of helicopter and their functions, Indian aerospace developments.

UNIT II - FLIGHT VEHICLES CONFIGURATIONS

L-6

Different types of wing configurations of aircraft, Different types of tail configurations of aircraft, configurations based on speed and engines.

UNIT III -PRINCIPLES OF FLIGHT

L-6

Physical properties and structure of the atmosphere, Temperature, Pressure and altitude relationships, stability of the atmosphere, Evolution of lift, drag and moment. Different types of drag. Pressure and skin friction coefficients.

UNIT IV - AERODYNAMICS AND PERFORMANCE

L-6

Airfoil nomenclature, classification of NACA airfoils, Angle of attack, Mach number, pressure distribution over different aerodynamic profile, aero foil characteristics- lift, drag curves - Wing geometry -aspect ratio, wing loading, center of pressure and aerodynamic center - Aircraft Equation of Motions - Aircraft maneuvers.

UNIT V - PROPULSION AND AIRPLANE STRUCTURES

L-6

Basic ideas about piston, turboprop and jet engines, Use of propeller and jets for thrust production, Principle of operation of rocket, Rocket engines types, General types of construction, Monocoque, semi-monocoque. Typical wing and fuselage structure. Metallic and non-metallic materials, Use of aluminum alloy, titanium, stainless steel and composite materials.

Total periods: 30

h. Learning Resources

i. Text Books:

1. Anderson, J.D., "Introduction to Flight", 6th edition, McGraw-Hill Higher Education, 2015
2. Steven Brandt, "Introduction to Aeronautics: A Design Perspective" 3rd edition, AIAA Education series, 2015

ii. References:

1. David J. Newman, "Interactive Aerospace Engineering and Design," International student edition Edition, McGraw-Hill Higher Education.
 2. Gregg Angles, "Introduction to Aeronautics", Random Exports, 2013
 3. Richard S. Shevell, "Fundamentals of Flight", 2nd edition, Prentice Hall, 1988
 4. A.C. Kermode, "Flight without Formulae", 5th edition, Pearson Education, 2008
 5. A.C. Kermode, R.H. Barnard, D.R. Philpott, "Mechanics of Flight", 12th Edition, Pearson, 2012
 6. Lalit Gupta, O P Sharma, "Fundamentals of Flight Basic Aerodynamics, Aircraft Structures, Aircraft Propulsion, Aircraft Systems (Vol 1 to 4), 1st edition, 2006
 7. John Cutler, "Understanding Aircraft Structures", 4th Edition, Wiley, 2014
 8. Dorothy Kent, "Aircraft Materials & Processes", 5th Edition, 1998
 9. A. Kanni Raj, "Materials: Aircraft & Aerospace", Create Space Independent Publishing Platform, 2015
 10. S.K. Ojha, "Flight performance of aircraft", AIAA Education Series, 1995
- E L; Carruthers, N B Houghton, "Aerodynamics for engineering students", 3rd edition, Hodder Arnold, 1982