

INTRODUCTION TO AEROSPACE TECHNOLOGY

V Semester: OPEN ELECTIVE - I								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
A5AE63	OEC	L	T	P	C	CIA	SEE	Total
		3	0	0	3	30	70	100
COURSE OBJECTIVES								
<ol style="list-style-type: none"> 1. To introduce the basic concepts of Aerospace technology and the current developments in the field. 2. To provide knowledge on the basic principles on which the development of aerodynamics, Structures, propulsion and satellite systems. 								
UNIT-I	HISTORY OF FLIGHT- THE AEROSPACE ENVIRONMENT							
<p>Balloons and dirigibles, heavier than air aircraft, commercial air transport, introduction of jet aircraft, helicopters, missiles, conquest of space, commercial use of space, exploring solar system and beyond. Earth's atmosphere, the temperature extremes of space, laws of gravitation, low earth orbit, microgravity, benefits of microgravity. The near earth radiative environment. The magnetosphere. Environmental impact on spacecraft. Meteoroids and micrometeoroids, space debris. Planetary environments</p>								
UNIT-II	AERODYNAMICS AND FLIGHT VEHICLE PROPULSION							
<p>Anatomy of the airplane, helicopter, launch vehicles and missiles, space vehicles. Static forces and moments on the vehicle. Understanding engineering models. Aerodynamics of wings and bodies. Generation of lift. Sources of drag. Force and moment coefficients, centre of pressure. Thrust for flight, the propeller, the jet engine, rocket engines- description, principles of operation. Governing equations.</p>								
UNIT-III	FLIGHT VEHICLE PERFORMANCE AND STABILITY							
<p>Performance parameters. Performance in steady flight, cruise, climb, range, endurance; accelerated flight- symmetric manoeuvres, turns, sideslips, take off and landing. Flight vehicle stability- longitudinal, lateral and directional- static, dynamic; trim, control. Handling qualities of airplanes</p>								
UNIT-IV	SATELLITE SYSTEMS ENGINEERING- HUMAN SPACE EXPLORATION							
<p>Satellite missions, an operational satellite system, elements of satellite, satellite subsystems. Satellite structures, mechanisms and materials. Power systems. Communication and telemetry. Thermal control. Attitude determination and control. Propulsion and station keeping. Space missions. Mission objectives. Case studies. Human space flight missions- goals, historical background. The Soviet and US missions. The Mercury, Gemini, Apollo (manned flight to the moon), Skylab, Apollo-Soyuz, Space Shuttle. International Space Station, extravehicular activity</p>								
UNIT-V	INTRODUCTION TO ENGINEERING DESIGN, AIR TRANSPORTATION							
<p>Design as a critical component of engineering education- as a skill- the process, design thinking, design drawing. Design for mission, performance and safety requirements. Concurrent engineering. Computer aided engineering, design project. Example: the lighter-than – air vehicle student design project at MIT. Air Transportation Systems- civil, military- objectives- principal constituents- the vehicle, the ground facilities, the organization- role. Regulation- national and international. Indian effort- civil and military- in the field of Aerospace Engineering.</p>								
Text Books:								
<ol style="list-style-type: none"> 1. Newman, D., Interactive Aerospace Engineering and Design, (with software and reference material on CD), McGraw-Hill, 2002, ISBN 0-07-112254-0. 2. Anderson, J.D., Introduction to Flight, fifth edition, Tata McGraw-Hill, 2007, ISBN: 0-07-006082 								
Reference Books:								

1. Russell Mikel, Aerospace and Aeronautical Engineering, Willford press, 2017.
2. Ajoykumar Kundu, Mark A Price and David Riordan, Conceptual Design: An Industrial Approach, Wiley-Blackwell, 2019.

COURSE OUTCOMES:

Students should able to

1. Compare the atmosphere conditions of different altitudes for spacecraft system
2. Analyze how lift, drag and thrust are generated and understand which components constitute them
3. Analyze the flight performance parameters with respective stability condition
4. Distinguish the different systems used in a satellite mission
5. Design lighter than air vehicle using Catia software