INTRODUCTION TO AEROSPACE ENGINEERING

III Semester

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
A5AE04	PCC	3	-	-	3	30	70	100

COURSE OBJECTIVES:

The course should enable the students to:

1. Describe the History of aeronautical engineering.
2. Apply the Basic aerodynamics
3. Examine the Structures and materials
4. Explain the Elements of airplane performance
5. Explain the Space flight (Astronautics) dynamics

UNIT-I HISTORY OF FLIGHT- THE AEROSPACE ENVIRONMENT

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

UNIT-II AERODYNAMICS AND FLIGHT VEHICLE PROPULSION

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.

UNIT-III FLIGHT VEHICLE PERFORMANCE AND STABILITY

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.

UNIT-IV FUNDAMENTALS OF ROCKET PROPULSION

Introduction to rocket propulsion-description, principle of operation, Rocket equation, fundamentals of solid propellant rockets-types of grain structures, Fundamentals of liquid propellant rockets-types of feed systems.

UNIT-V SATELLITE SYSTEMS ENGINEERING- HUMAN SPACE EXPLORATION

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.

Text Books:

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. Barnard, R. H. and Philpot, D.R., Aircraft Flight, 3rd edition,Pearson, 2004,ISBN: 81-297-0783- 7.
2. Hirst, M., The Air Transport System, Woodhead Publishing Ltd,Cambridge, England, 2008

COURSE OUTCOMES:

At the end of the course the student should be 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. Compare the working of solid and liquid propellant rockets
5. Distinguish the different systems used in a satellite mission