INTRODUCTION TO AEROSPACE ENGINEERING

II Semester: AE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AAE001	Foundation	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

OBJECTIVES:

The course should enable the students to:

I. Gain knowledge about traditional engineering fundamentals, creative idea generation and problem solving skills, high-technology approaches to engineering complex systems, technical system integration and operation
II. Understand the methodology and experience of analysis, modeling, and synthesis
III. Understand the evolution of human space exploration with a brief introduction to the missions conducted by various countries
IV. knowledge in satellite engineering and the systems involved in the operation of a satellite.

COURSE LEARNING OUTCOMES (CLOs):

1. Understand, Identify, Study and comprehend processes that lead to solutions to a particular problem.
2. Develop one- self to gain knowledge about current technical term which helps to extend the outputs of research.
3. Outline performance of the output of research, development, or design.
4. Identify, solve new problems and gain new knowledge.
5. Understand about the performance parameters, performance in steady flight, cruise, climb, range, endurance, accelerated flight symmetric maneuvers, turns, sideslips, takeoff and landing.
6. Getting knowledge about the theory to produce a safe, effective, economic production of aircraft.
7. Understand the theoretical knowledge behind the design and development of aircrafts.
8. Gain knowledge about the basic Aerodynamics, Flight mechanics and aircraft structures which are the foundation stones for knowledge based exams.
9. Discuss the principle constituents of the transportation system involved in civil and commercial aircrafts and understanding the working of space propulsion systems.
10. Extend the outputs of earlier research and discover good ideas for new products or improving current products.
11. Memorize procedure and steps to keep the products working effectively.
12. Gain knowledge about the anatomy of aircraft, helicopters, satellites and other air vehicles, and about the working importance of each component in an air vehicle.
13. Ability to summarize the efficiency of the design in achieving the mission goal and safety of flight.
14. Understand the impact of radiations in the outer space on the spacecrafts and satellites and safety precautions to be followed.
15. Choose a concept or idea of technical real time problems to form solutions for the same.

UNIT-I	\ HISTORY OF FLIGHT AND SPACE ENVIRONMENT	Classes: 09
Balloons and dirigibles, heavier than air aircraft, commercial air transport; Introduction of jet aircraft, helicopters, missiles; Conquest of space, commercial use of space; Different types of flight vehicles, classifications exploring solar system and beyond, a permanent presence of humans in space; Earth's atmosphere, the standard atmosphere; The temperature extremes of space, laws of gravitation, low earth orbit, microgravity, benefits of microgravity; Environmental impact on spacecraft, space debris; Planetary environments.		
UNIT -II	**INTRODUCTION TO AERODYNAMICS**	**Classes: 09**
Anatomy of the airplane, helicopter; Understanding engineering models; Aerodynamic forces on a wing, force coefficients; Generating lift, moment coefficients; Aerodynamic forces on aircraft – classification of NACA airfoils, aspect ratio, wing loading, mach number, centre of pressure and aerodynamic centre aerofoil characteristics-lift, drag curves; Different types of drag.		
UNIT-III	**FLIGHT VEHICLE PERFORMANCE AND STABILITY**	**Classes: 09**
Performance parameters, performance in steady flight, cruise, climb, range, endurance, accelerated flight symmetric maneuvers, turns, sideslips, takeoff and landing. Flight vehicle Stability, static stability, dynamic stability; Longitudinal and lateral stability; Handling qualities of the airplanes		
UNIT-IV	**INTRODUCTION TO AIRPLANE STRUCTURES AND MATERIALS, POWER PLANTS**	**Classes: 09**
General types of construction, monocoque, semi-monocoque; Typical wing and fuselage structure; Metallic & non-metallic materials, use of aluminum alloy, titanium, stainless steel and composite materials; Basic ideas about engines, use of propeller and jets for thrust production; Principles of operation of rocket, types of rockets.		
UNIT-V	**SATELLITE SYSTEMS ENGINEERING HUMAN SPACE EXPLORATION**	**Classes: 09**
Satellite missions, an operational satellite system, elements of satellite, satellite bus subsystems; Satellite structures, mechanisms and materials; Power systems; Communication and telemetry; Propulsion and station keeping; Space missions, mission objectives. Goals of human space flight missions, 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; The space suit; The US and Russian designs; Life support systems, flight safety; Indian effort in aviation, missile and space technology.		

Text Books:

1. Anderson J. D, "Introduction to Flight", McGraw-Hill, 5th Edition, 1989.
2. Newman D, "Interactive Aerospace Engineering and Design", McGraw-Hill, 1st Edition, 2002

Reference Books:

1. Kermode, A. C, "Flight without Formulae", McGraw Hill, 4th Edition, 1997.
2. Barnard R.H and Philpot. D.R, "Aircraft Flight", Pearson, 3rd Edition, 2004.
3. Swatton P. J, "Flight Planning", Blackwell Publisher, 6th Edition, 2002.

Web References:

1. https://www.aerospaceengineering.es/book/
2. https://www.ne.nasa.gov/education/
3. https://nptel.ac.in

E-Text Books:
1. https://www.e-booksdirectory.com/ 2. https://www.adl.gatech.edu/extrovert/Ebooks/ebook_Intro.pdf 3. https://www.academia.edu/7950378/Introduction_to_Flight_-_Anderson_5th_Ed