Course code	Course Name	L-T-P-Credits	Year of Introduction
ME461	Aerospace Engineering	3-0-0-3	2016

Prerequisite : Nil

Course Objectives: :

- To understand the fundamentals of aerospace engineering
- To provide an understanding of flight instruments

Syllabus:

The atmosphere, airfoil theory, 2D, 3D or Finite aero foils Propellers, Aircraft performance, Flight Instruments, stability of aircrafts, wind tunnel testing

Expected Outcomes:

The students will be able to

i. Identify, formulate and solve aerospace engineering problems
ii. Perform analysis of flight dynamics of aircrafts

Text books:

1. A.C. Kermode, Mechanics of flight, Prentice Hall, 2007
2. Anderson, Fundamentals of Aerodynamics, McGraw-Hill, 2010
3. EHJ Pallett, Aircraft Instruments and Integrated systems, Longman,1992

Reference books:

1. Houghton and brock, Aerodynamics for Engineering Student, Hodder & Stoughton,1977

COURSE PLAN

Module	Contents	Hours	End Sem. Exam. Marks
I	The atmosphere-characteristics of troposphere , stratosphere , thermosphere, and ionosphere- pressure, temperature and density variations in the atmosphere. Application of dimensional analysis – aerodynamic force – model study and similitude. 2D aero foils -Nomenclature and classification- pressure distribution in inviscid and real flows- momentum and circulation theory of aerofoil- characteristics.	8	15%
II	3D or Finite aero foils – effect of releasing the wingtips- wing tip vortices- replacement of finite wing by horse shoe vertex system, lifting line theory-wing load distribution – aspect ratio, induced drag calculation of induced drag from momentum considerations. Skin friction and from drag- changes in finite wing plan shape	7	15%
FIRST INTERNAL EXAMINATION			

III	Propellers – momentum and blade element theories –propeller coefficients and charts. Aircraft performance-straight and level flight –power required and power available graphs for propeller and jet aircraft	**6**	**15%**
IV	Gliding and climbing –rate of climb-service and absolute ceilings-gliding angle and speed of flattest glide takeoff and landing performance – length of runway required- aircraft ground run- circling flight – radius of tightest turn-jet and rocket assisted take –off high lift devices-range and endurance of airplanes-charts for piston and jet engine aircrafts.	**7**	**15%**
SECOND INTERNAL EXAMINATION			
V	Flight Instruments-airspeed indicator, calculation of true air speed-altimeter, gyrohorizon -direction indicator-vertical speed indicator –turn and back indicator-air temperature indicator. (Brief description and qualitative ideas only). Ideas on stability-static and dynamic stability- longitudinal, lateral and directional stability- controls of an aero plane- aerodynamic balancing of control surfaces- mass balancing (Qualitative ideas only).	**7**	**20%**
V1	Principles of wind tunnel testing –open and closed type wind tunnels-wind tunnel balances supersonic wind tunnels. Study of subsonic, Transonic, and supersonic aircraft engines (Description with figures Only).Elementary ideas on space travel-calculation of earth orbiting and escape velocities ignoring air resistance and assuming circular orbit.	**7**	**20%**
END SEMESTER EXAMINATION			

Question Paper Pattern

Maximum marks: 100 **Time: 3 hrs**

The question paper should consist of three parts

Part A

There should be 2 questions each from module I and II
Each question carries 10 marks
Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

Part B

There should be 2 questions each from module III and IV
Each question carries 10 marks
Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

Part C

There should be 3 questions each from module V and VI
Each question carries 10 marks
Students will have to answer any four questions out of 6 (4X10 marks =40 marks)

Note: Each question can have a maximum of four sub questions, if needed.