UNIVERSITY OF KERALA

B. TECH. DEGREE COURSE

(2013 SCHEME)

SYLLABUS FOR

VI SEMESTER

AERONAUTICAL ENGINEERING
## Scheme -2013
### VI Semester
#### Aeronautical Engineering (S)

<table>
<thead>
<tr>
<th>Course No</th>
<th>Name of subject</th>
<th>Credits</th>
<th>Weekly load, hours</th>
<th>C A Marks</th>
<th>Exam Duration Hrs</th>
<th>U E Max Marks</th>
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<tbody>
<tr>
<td>13.601</td>
<td>Aircraft Design (S)</td>
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<td>Computational Methods in Engineering (S)</td>
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<td>13.603</td>
<td>Propulsion-I (S)</td>
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<td>Heat and Mass Transfer (MSU)</td>
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<td>13.605</td>
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<td>13.606</td>
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<td>Low Speed Aerodynamics Lab (S)</td>
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### 13.606 Elective II

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<tr>
<td>13.606.1</td>
<td>High Speed Aerodynamics (S)</td>
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<td>13.606.2</td>
<td>Wind Tunnel Technology (S)</td>
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<td>Control Navigation and Guidance (S)</td>
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<td>Advanced Mechanics of Solids (S)</td>
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13.501 AIRCRAFT DESIGN(S)

Teaching Scheme: 3(L) - 1(T) - 0(P)  
Credits: 4

Course Objective:

To understand the conceptual design and detailed design of Aircrafts.

Module – I

Overview of design process: Introduction, Phases of Aircraft design, Aircraft conceptual design process. Introduction to Weight estimations - Takeoff weight build up, Empty-Weight estimation, Fuel-Fraction estimation, Take-off weight calculation.

Module – II

Wing layouts and their characteristics: Type of Wings, Wing Geometry, Wing Loading, Selection of Thrust to Weight and Wing Loading, Airfoil Selection. Introduction to Tail Geometry and Arrangements, Wing/Tail Layout and Loft.

Module – III


Module – IV


Introduction to fatigue: Safe life and fail-safe structures, Designing against fatigue, Fatigue strength of components, Prediction of aircraft fatigue life and crack propagation.

References:


**Internal Continuous Assessment (Maximum Marks-50)**

- 50% - Tests (minimum 2)
- 30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.
- 20% - Regularity in the class

**University Examination Pattern:**

*Examination duration: 3 hours*  
*Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

**Part A (20 marks)** - Five Short answer questions of 4 marks each. All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

**Part B (80 Marks)** - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

**Course Outcome:**

After successful completion of this course, the students will be familiar with the concepts of aircraft configuration and its influence on flight performance. Also they will be familiar with the principles of aircraft design from the point of view of technology of production and operating.
13.602 COMPUTATIONAL METHODS IN ENGINEERING (S)

Teaching Scheme: 3(L) - 1(T) - 0(P)  
Credits: 4

Course Objectives:

This course aims at providing the necessary basic concepts of a few numerical methods and give procedures for solving numerically different kinds of problems occurring in engineering and technology.

Module – I


Module – II

Interpolation and approximation: Interpolation with unequal intervals - Lagrange's interpolation – Newton’s divided difference interpolation – Cubic Splines - Interpolation with equal intervals - Newton’s forward and backward difference formulae.


Module – III


Module – IV

Boundary value problems in ordinary and partial Differential equation: Finite difference methods for solving two-point linear boundary value problems - Finite difference techniques for the solution of two dimensional Laplace’s and Poisson’s equations on rectangular domain – One dimensional heat flow equation by explicit and implicit (Crank Nicholson) methods –One dimensional wave equation by explicit method.

References:


**Internal Continuous Assessment (Maximum Marks-50)**

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

**University Examination Pattern:**

Examination duration: 3 hours  
Maximum Total Marks: 100

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

**Course Outcome:**

*Students successfully completing this course will have a clear perception of the power of numerical techniques, ideas and would be able to demonstrate the applications of these techniques to problems drawn from industry, management and other engineering fields.*
13.603 PROPULSION – I (S)

Teaching Scheme: 2(L) - 1(T) - 0(P)  
Credits: 3

Course Objectives:

To introduce basic concepts and salient features of engine components of jet propelled engines which are operated in atmosphere to students. This course is also aimed at making students familiarize with advanced jet propulsion methods like hypersonic propulsion.

Module – I


Module – II


Module – III

Nozzles: Theory of flow in isentropic nozzles – design, Convergent nozzles and nozzle choking - Nozzle throat conditions Nozzle efficiency - nozzle operating characteristics for isentropic flow, nozzle flow and shock waves Losses in nozzles - Over expanded and under-expanded nozzles - Ejector and variable area nozzles - Interaction of nozzle flow with adjacent surfaces - Thrust reversal.

Module – IV

Propellers: Ideal momentum theory and blade element theory and their relative merits, numerical problems on the performance of propellers using propeller charts, selection of
propellers, fixed, variable and constant speed propellers, prop-fan, material for propellers, shrouded propellers helicopter, rotor in hovering.

References:


Internal Continuous Assessment (Maximum Marks-50)

50% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.
20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours Maximum Total Marks: 100

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Course Outcome:

Students successfully completing this course are expected to understand the aircraft propulsion systems and to know the details of intake and exhaust systems.
13.604 HEAT AND MASS TRANSFER (MSU)

Teaching Scheme: 3(L) - 1(T) - 0(P)  
Credits: 4

Course Objective:

- To introduce a basic study of the phenomena of heat and mass transfer, to develop methodologies for solving a wide variety of practical engineering problems,
- To apply analytical and numerical methods to solve conduction problems.
- To combine thermodynamics and fluid mechanics principles to analyze heat convection processes.
- To provide useful information concerning the performance and design complex heat transfer applications, such as heat exchangers and fins
- To integrate radiation aspects into real-world global heat transfer problems.

Module – I


Module – II

Elementary ideas of hydrodynamics and thermal boundary layers-Thickness of Boundary layer-Displacement, Momentum and Energy thickness (description only).

Convection heat transfer: Newton’s law of cooling- Laminar and Turbulent flow, Reynold’s Number, Critical Reynold’s Number, Prandtl Number, Nusselt Number, Grashoff’s Number and Rayleigh’s Number. Dimensional analysis Buckingham’s Pi theorem- Application of dimensional analysis to free and forced convection- empirical relations- problems using empirical relations.

Module – III

Combined conduction and convection heat transfer-Overall heat transfer coefficient - Heat exchangers: Types of heat exchangers, AMTD, Fouling factor, Analysis of Heat exchangers- LMTD method, Correction factor, Effectiveness- NTU method, Special type of heat exchangers (condenser and evaporator, simple problems only)
Fins: Types of fins - Heat transfer from fins of uniform cross sectional area- Fin efficiency and effectiveness. Boiling and condensation heat transfer (elementary ideas only).

Introduction to heat pipe.

**Module – IV**

Radiation- Nature of thermal radiation-definitions and concepts- monochromatic and total emissive power-Intensity of radiation- solid angle- absorptivity, reflectivity and transmissivity-Concept of black body- Planck’ law- Kirchoff’s law- Wein’s displacement law- Stefan Boltzmann’s law- black, gray and real surfaces-Configuration factor (derivation for simple geometries only)- Electrical analogy- Heat exchange between black/gray surfaces-infinite parallel plates, equal and parallel opposite plates-perpendicular rectangles having common edge- parallel discs (simple problems using charts and tables). Radiation shields (no derivation).


Convective mass transfer- Evaluation of mass transfer coefficient- empirical relations- simple problems- analogy between heat and mass transfer.


**References:**


**Internal Continuous Assessment (Maximum Marks-50)**

50% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project etc.
20% - Regularity in the class
University Examination Pattern:

Exam duration: 3 hours  Maximum Total Marks: 100

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Note: Use of approved data book is permitted in the examination hall.

Course Outcome:

After successful completion of the course, the student will be able to:

- understand the basic laws of heat transfer.
- apply principles of heat and mass transfer to basic engineering systems
- demonstrate general knowledge of heat transfer [conduction, convection, radiation], and general knowledge of mass transfer [molecular diffusion, convection].
- analyse the performance and design of heat exchangers.
- design heat and mass transfer processes and equipment.
13.605 CONTROL SYSTEMS (S)

Teaching Scheme: 3(L) - 1(T) - 0(P)  
Credits: 4

Course Objective:

*To develop an understanding of feedback control systems and the parameters that influence their stability and performance.*

**Module – I**

Introduction to AFCS: Historical review - control systems applications in aircrafts, missiles, spacecrafts – aircraft flight control systems-models representations – open loop and closed loop -effects of feedback – Transfer function– Block diagram representation of control systems, Reduction of block diagrams, Signal flow graph representations with applications and problems in aircraft control, systems.

**Module – II**

Model representations: Mathematical models of physical systems - Simple pneumatic, hydraulic and thermal systems-Mechanical-Electrical systems – Analogies introduction to state space –concept of state variables and state models and derivation of state models from block diagram with reference to aircraft models.

**Module – III**

Time response and steady state errors: Response of systems to different inputs viz., Step input, impulse, ramp, parabolic and sinusoidal inputs, Time response of first and second order systems, steady state errors and error constants of unity feedback circuit. Automatic controls systems – Controllers - P, PI, PID controllers in aircraft FCS.

**Module – IV**


**References:**


**Internal Continuous Assessment (Maximum Marks-50)**

- 50% - Tests (minimum 2)
- 30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.
- 20% - Regularity in the class

**University Examination Pattern:**

- Examination duration: 3 hours
- Maximum Total Marks: 100

The question paper shall consist of 2 parts.

**Part A (20 marks)** - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

**Part B (80 Marks)** - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

**Course Outcome:**

After this programme students are expected to have

- Ability to understand low order linear mathematical models of physical systems and their manipulation.
- Knowledge on how negative feedback affects dynamic response and its characterization by primary analysis and performance measures.
- Knowledge on fundamental mathematical tools used in system analysis and design.
13.606.1 HIGH SPEED AERODYNAMICS (S) (Elective II)

Teaching Scheme: 3(L) - 1(T) - 0(P)  
Credits: 4

Course Objectives:

To introduce students the basic concepts in the field of high speed aerodynamics. Transonic and supersonic flow problems. External flows (supersonic airfoils, wings and aircraft in general) and experimental methods

Module – I


Module – II


Module – III

Flow in constant area duct with friction and heat transfer: Fanno flow and Rayleigh flow - flow tables and charts for Fanno flow and Rayleigh flow.

Module – IV


Experimental methods: Transonic, Supersonic and hypersonic wind tunnels and characteristic features, their operation and performance-Flow visualization methods of supersonic flows.

References


**Internal Continuous Assessment** *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

**University Examination Pattern:**

*Examination duration: 3 hours*          *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

**Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.**

**Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.**

**Course outcome:**

*Upon completion the student understands the basic concepts and problems addressed in the field of aerodynamics at transonic and supersonic speeds.*
13.606.2 WIND TUNNEL TECHNOLOGY (S) (Elective II)

Teaching Scheme: 3(L) - 1(T) - 0(P)          Credits: 4

Course Objectives:

The students are exposed to various types and techniques of Aerodynamic data generation on aerospace vehicle configurations in the aerospace industry.

Module – I

Principles of model testing: Buckingham Theorem – Non dimensional numbers – Scale effect – Geometric Kinematic and Dynamic similarities.

Module – II

Types and functions of wind tunnels: Classification and types – special problems of testing in subsonic, transonic, supersonic and hypersonic speed regions – Layouts – sizing and design parameters.

Module – III


Module – IV

Conventional measurement methods: Force measurements and measuring systems – Multi component internal and external balances – Pressure measurement system - Steady and Unsteady Pressure- single and multiple measurements- Velocity measurements – Intrusive and Non-intrusive methods – Flow visualization techniques surface flow, oil and tuft - flow field visualization, smoke and other optical and nonintrusive techniques

Special wind tunnel techniques: Intake tests – store carriage and separation tests - Unsteady force and pressure measurements – wind tunnel model design.

References

2. NAL-UNI Lecture Series 12: Experimental Aerodynamics, NAL SP 98 01 April 1998.
5. Short term course on Flow Visualization Techniques, NAL, 2009
6. Lecture course on *Advanced Flow Diagnostic Techniques* 17-19 September 2008 NAL, Bangalore

**Internal Continuous Assessment** *(Maximum Marks-50)*

- 50% - Tests *(minimum 2)*
- 30% - Assignments *(minimum 2)* such as home work, problem solving, literature survey, seminar, term-project, software exercises, etc.
- 20% - Regularity in the class

**University Examination Pattern:**

*Examination duration: 3 hours*  
*Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

**Part A (20 marks)** - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

**Part B (80 Marks)** - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

**Course outcome:**

At the end of this course the students will be able to use various techniques of Aerodynamic data generation.
13.606.3 FINITE ELEMENT METHOD (S) (Elective II)

Teaching Scheme: 3(L) - 1(T) - 0(P) Credits: 4

Course Objectives:

- To acquaint with basic concepts of finite element formulation methods.
- To practice finite element methodologies through simple structural and heat transfer problems.

Module – I


Beam element: Beam relationships – 1-D beam element FE formulation - element stiffness matrix – load considerations – boundary conditions – member end forces.

Module – II


Interpolation – shape function – Lagrange interpolation - 1D linear and quadratic, 2D linear triangle and bilinear rectangular elements.


Module – III


Module – IV


References


Internal Continuous Assessment (Maximum Marks-50)

50% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, literature survey, seminar, term-project, software exercises, etc.
20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours  Maximum Total Marks: 100

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.
Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

**Course outcome:**

At the end of this course, students will know the mathematical formulation of the finite element method and how to apply it to basic (linear) ordinary and partial differential equations. Students will also learn how to implement the finite element method efficiently in order to solve a particular equation.
13.606.4 HELICOPTER AERODYNAMICS (S) (Elective II)

Teaching Scheme: 3(L) - 1(T) - 0(P)  
Credits: 4

Course Objectives:

To understand and acquire a good understanding on vertical flight vehicles, its principles, aerodynamics, performance and basic design aspects of helicopter.

Module – I

Quality Introduction and elements of helicopter aerodynamics: Brief History of Helicopters- Early Years, first word war era, Inter-war years, second world war era, Post world war Years. The Helicopter from an Engineering viewpoint. Configurations based on torque reaction-Jet rotors and compound helicopters- Methods of control – Collective and cyclic pitches changes - Lead - Lag and flapping hinges, lift dissymmetry, Helicopters contra rotating, tandem and tail rotor configuration and their advantages and disadvantages. Auto rotation of helicopter. Rotor wake model, Ground effect on lifting rotors.

Module – II

Quality Rotor in vertical flight: momentum theory and wake analysis: Momentum theory for hover, Non-dimensionalization, Figure of Merit, Axial Flight, Momentum theory of Vertical climb, Modeling the stream tube, Descent, Wind tunnel Test Results, Complete Induced Velocity curve.

Blade Element Theory: Basic Method, Thrust Approximation, Non Uniform Flow, Ideal Twist, Blade Mean lift Coefficient, Power Approximations, Tip Loss,(All topics in Hovering condition) Examples of Hover Characteristics.

Module – III

Rotor in forward flight: rotor mechanism: The Edgewise rotor, Flapping Motion, Rotor Control, Equivalence of Flapping and Feathering (Blade Sailing, Lagging motion, Coriolis Acceleration, Lag frequency, Blade Flexibility, Ground Resonance).


Module – IV

Rotor aerodynamic design: Blade Section design, Blade Tip Shapes (Rectangular, Swept, Advance Planforms), Tail Rotors (Propeller Moment, Precession-Yaw Agility, Calculation of Downwash, Yaw Acceleration), Parasite Drag, Rear Fuselage Upsweep, Aerodynamic Design process.
References

6. Prouty R W, "Helicopter Aerodynamics"

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

University Examination Pattern:

*Examination duration: 3 hours*  
*Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

**Part A** *(20 marks)* - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

**Part B** *(80 Marks)* - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Course outcome:

*At the end of this course, students will be able:*

- To perform the Aerodynamics calculation of Rotor blade
- To perform stability and control characteristics of Helicopter
- To perform and control Rotor vibration
13.606.5 CONTROL NAVIGATION AND GUIDANCE (S) (Elective II)

Teaching Scheme: 3(L) - 1(T) - 0(P)  
Credits: 4

Course Objectives:
- To introduce the basic concepts of navigation & guidance systems of aircraft.
- To develop an understanding of the principles of aircraft motion measurement and control and sensors and actuator for aircraft control and guidance.

Module – I
Inertial Navigation Systems: INS components: transfer function and errors-The earth in inertial space, the coriolis effect-Mechanisation. Platform and Strap down, INS system block diagram, Different co-ordinate systems, Schuler loop, compensation errors, Gimbal lock, Alignment.

Module – II
Radio navigation: Different types of radio navigation- ADF, VOR/DME- Doppler –LORAN, DECCA and Omega – TACAN.

Module – III

Module – IV

References


**Internal Continuous Assessment** *(Maximum Marks-50)*

- 50% - Tests (minimum 2)
- 30% - Assignments (minimum 2) such as home work, problem solving, literature survey, seminar, term-project, software exercises, etc.
- 20% - Regularity in the class

**University Examination Pattern:**

*Examination duration: 3 hours   Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

**Part A** (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

**Part B** (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

**Course outcome:**

At the end of this course the students will be able to:

- Understand flight dynamics and select the appropriate avionics sensor to measure the corresponding motion variable;
- Analyze the functional structure of avionics systems within a modern aircraft and to define the performance of a component sub-system.
13.606.6 ADVANCED MECHANICS OF SOLIDS (S) (Elective II)

Teaching Scheme: 3(L) - 1(T) - 0(P)  
Credits: 4

Course Objectives:

- To impart concepts of stress and strain analysis in a solid.
- To study the methodologies in theory of elasticity at a basic level.
- To acquaint with energy methods to solve structural problems.

Module – I


Module – II


Module – III

Special problems in bending: Unsymmetrical bending – shear center – curved beams with circular and rectangular cross-section.

Energy methods in elasticity: Strain energy of deformation – special cases of a body subjected to concentrated loads, due to axial force, shear force, bending moment and torque – reciprocal relation – Maxwell reciprocal theorem – Castigliano’s first and second theorems – virtual work principle – minimum potential energy theorem - complementary energy.

Module – IV

Torsion of non-circular bars: Saint Venant’s theory - Prandtle’s method - solutions for circular and elliptical cross-sections - membrane analogy - torsion of thin walled open and closed sections – shear flow.

References


**Internal Continuous Assessment** (*Maximum Marks-50*)

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

**University Examination Pattern:**

*Examination duration: 3 hours  Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

*Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.*

*Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.*

**Course outcome:**

At the end of this course the students will be able to:

- Understand advanced stress/strain correlations.
- Obtain simple mathematical and physical relationships between mechanics and materials.
- Model the plastic behaviour, as well as the fatigue, fracture and creep response, of common engineering materials.
- Establish links between theoretical and practical applications; identify problems and formulate solution strategies.
13.607 LOW SPEED AERODYNAMICS LAB (S)

Teaching Scheme: 0(L) - 0(T) - 3(P)  
Credits: 3

Course Objective:

To study experimentally the aerodynamic forces on different bodies at all flow regimes.

List of Experiments:

1. Study of the pressure distribution over smooth and rough cylinder.
2. Study of the Pressure distribution over symmetric airfoil.
3. Study of the Pressure distribution over cambered airfoil & thin airfoils.
4. Study of the characteristics of three dimensional airfoils involving measurement of lift, drag, pitching moment.
5. Calibration of subsonic wind tunnel.
6. Pressure distribution over smooth and rough cylinder.
7. Pressure distribution over symmetric airfoils.
8. Pressure distribution over cambered airfoils & thin airfoils.
10. Flow visualization studies in low speed flow over airfoil with different angle of incidence.
11. Boundary layer investigation on a flat plate zero, favourable and adverse pressure gradient flow.
15. Calibration of angle of attack vs lift coefficient of an aerofoil.

*Note: At least 10 experiments from the above list shall be conducted.*

Internal Continuous Assessment (Maximum Marks-50)

40% - Test
40% - Class work and Record
20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours  
Maximum Total Marks: 100

Questions based on the list of experiments prescribed.

80% - Procedure, conducting experiment, results, tabulation and inference
20% - Viva voce

Candidate shall submit the certified fair record for endorsement by the external examiner.

Course Outcome:

Students will get an insight into the use of different experimental techniques used to assess the aerodynamic forces on different bodies.
13.608 FLUID & FLIGHT MECHANICS LAB (S)

Teaching Scheme: 0(L) - 0(T) - 3(P)  
Credits: 3

Course Objective:
To experimentally study the principles of fluid and flight mechanics.

List of Experiments:
1. Determinations of flow throw pipes, Losses in pipes.
2. Calibration of Orifice meter and Venturi meter.
3. Flow through notches and weir
4. Flow through open Orifice -Cd, Cc and Cv
5. Buoyancy experiment -Meta Centric height
6. Study and experiment on Bernoulli’s theorem apparatus.
7. Study and experiment on Reynolds apparatus.
8. Flight Simulator Computer Equipment
9. Aero-modeling Flight Simulator
10. Study of aero-modeling Equipments and tools
11. Determination of phugoid motion in terms of altitude.
12. Practical investigation on rate of climb and turn radius
13. Systematic study of CG location variation in any trainer aircraft.

Note: At least 10 experiments from the above list shall be conducted.

Internal Continuous Assessment (Maximum Marks-50)
40% - Test
40% - Class work and Record
20% - Regularity in the class

University Examination Pattern:
Examination duration: 3 hours  
Maximum Total Marks: 100
Questions based on the list of experiments prescribed.
80% - Procedure, conducting experiment, results, tabulation and inference
20% - Viva voce
Candidate shall submit the certified fair record for endorsement by the external examiner.

Course Outcome:
At the end of the course, the students will be familiar with the various experimental techniques to study the principles of fluid and flight mechanics and its effect on of aircrafts.