UNIT-I ROCKETS SYSTEM

UNIT-II AERODYNAMICS OF ROCKETS AND MISSILES

UNIT-III MOTION IN SPACE AND GRAVITATIONAL FIELD
One Dimensional and Two Dimensional rocket Motions in Free Space and Homogeneous Gravitational Fields–description of Vertical, Inclined and Gravity Turn Trajectories– Determination of range and Altitude Simple Approximations to Burnout Velocity.

UNIT-IV STAGING AND CONTROL

UNIT-V MATERIALS USED FOR ROCKETS AND MISSILES
Selection of Materials –Special Requirements of Materials to Perform under Adverse Conditions.

TEXT BOOKS

REFERENCES
AE-801(2)

FATIGUE AND FRACTURE MECHANICS

UNIT-I FATIGUE OF MATERIALS

UNIT-II FATIGUE BEHAVIOUR
Low cycle and high cycle fatigue - Coffin - Manson’s relation - Transition life – cyclic strain hardening and softening - Analysis of load histories - Cycle counting techniques –Cumulative damage.

UNIT-III PHYSICAL ASPECTS OF FATIGUE
Phase in fatigue life - Crack initiation - Crack growth - Final Fracture - Dislocations –fatigue fracture surfaces.

UNIT-IV FRACTURE MECHANICS
Strength of cracked bodies - Potential energy and surface energy - Griffith’s theory, extension of Griffith’s theory to ductile materials - stress analysis of cracked bodies - Effect of thickness on fracture toughness - stress intensity factors for typical geometries.

UNIT-V FATIGUE DESIGN AND TESTING
Safe life and Fail-safe design philosophies - Importance of Fracture Mechanics in aerospace structures - Application to composite materials and structures.

TEXT BOOKS

REFERENCES
UNIT-I WELDING IN AIRCRAFT STRUCTURE
Equipments used in welding shop and their maintenance – Ensuring quality welds – Welding jigs and fixtures – Soldering and brazing.

SHEET METAL REPAIR AND MAINTENANCE
Inspection of damage – Classification – Repair or replacement – Sheet metal inspection – N.D.T. Testing – Riveted repair design, Damage investigation.

UNIT-II PLASTICS AND COMPOSITES IN AIRCRAFT

UNIT-III AIRCRAFT JACKING AND RIGGING

UNIT-IV REVIEW OF HYDRAULIC AND PNEUMATIC SYSTEM

UNIT-V SAFETY PRACTICES

TEXT BOOK

REFERENCES
UNIT-I BASIC CONCEPTS ATC
Objectives of ATS - Parts of ATC service – Scope and Provision of ATCs–VFR & IFR operations – Classification of ATS air spaces – Varies kinds of separation – Altimeter setting procedures – Establishment, designation and identification of units providing ATS– Division of responsibility of control.

UNIT-II AIR TRAFFIC SERVICES
Area control service, assignment of cruising levels minimum flight altitude ATS routes and significant points – RNAV and RNP – Vertical, lateral and longitudinal separations based on time / distance –ATC clearances – Flight plans – position report.

UNIT-III FLIGHT INFORMATION ALERTING SERVICES AND RULES OF THE AIR

UNIT-IV AERODROME DATA AND PHYSICAL CHARACTERISTICS

UNIT-V VISUAL AIDS FOR NAVIGATION, VISUAL AIDS FOR DENOTING OBSTACLES EMERGENCY
Visual aids for navigation Wind direction indicator – Landing direction indicator – Location and characteristics of signal area –Markings, general requirements–Various markings–Lights, general requirements – Aerodrome beacon, identification beacon –Simple approach lighting system and various lighting systems – VASI & PAPI – Visual aids for denoting obstacles; object to be marked and lighter – Emergency.

TEXT BOOK

REFERENCES
AE 802
HELICOPTER AERODYNAMICS

UNIT I - ELEMENTS OF HELICOPTER AERODYNAMICS
Configurations based on torque reaction-Jet rotors and compound helicopters- Methods of control — Collective and cyclic pitch changes - Lead - Lag and flapping hinges.

UNIT II- ROTOR THEORY
Hovering performance - Momentum and simple blade element theories – Figure of merit - Profile and induced power estimation - Constant chord and ideal twist rotors.

UNIT III - POWER ESTIMATES
Induced, profile and parasite power requirements in forward flight-Performance curves with effects of altitude- Preliminary ideas on helicopter stability

UNIT IV - LIFT, PROPULSION AND CONTROL OF VTOL and STOL AIRCRAFT
Various configuration - Propeller, rotor, ducted fan and jet lift - Tilt wing and vectored thrust - Performance of VTOL and STOL aircraft in hover, transition and forward motion.

UNIT V - GROUND EFFECT
Types - Hover height, lift augmentation and power calculations for plenum chamber and peripheral jet machine - Drag of hovercraft on land and water. Applications of hovercraft.

TEXTBOOKS

REFERENCES
UNIT-I FUNDAMENTAL OF COMPUTATIONAL FLUID DYNAMICS

UNIT-II PANEL METHODS

UNIT-III DISCRETIZATION
Boundary layer Equations and methods of solution - Implicit time dependent methods for inviscid and viscous compressible flows - Concept of numerical dissipation – Stability properties of explicit and implicit methods - Conservative upwind discretization for Hyperbolic systems.

UNIT-IV FINITE ELEMENT TECHNIQUES
Finite Element Techniques in Computational Fluid Dynamics; introduction - Strong and Weak Formulations of a Boundary Value Problem - Strong formulation–Weighted Residual Formulation – Variational Formulation - Piecewise defined shape functions - Implementation of the FEM.

UNIT-V FINITE VOLUME TECHNIQUES

TEXT BOOK

REFERENCES
LIST OF EXPERIMENT

1. Introduction to Modeling and Simulation Software to Aerodynamic problems.
2. Solution for the one dimensional wave equations using explicit method of Lax Using Finite Difference Method (code development)
4. Generation of the Algebraic Grid (Code Development)
5. Generation of the Elliptic Grids (Code Development)
7. Numerical Simulation of supersonic flow over a Wedge using commercial Software packages.
8. Numerical Simulation of flat Plate Boundary Layer using commercial Software packages.
UNIT-I INTRODUCTION
Development of air transportation, comparison with other modes of transport – Role of IATA, ICAO – The general aviation industry airline – Factors affecting general aviation, use of aircraft, airport: airline management and organisation – levels of management, functions of management, Principles of organisation planning the organisation – chart, staff departments & line departments

UNIT-II AIRLINE ECONOMICS AND PLANNING
Forecasting – Fleet size, Fleet planning, the aircraft selection process, operating cost, passenger capacity, load factor etc. – Passenger fare and tariffs – Influence of geographical, economic & political factors on routes and route selection.


UNIT-III AIRLINES SCHEDULING
Equipment maintenance, Flight operations and crew scheduling, Ground operations and facility limitations, equipments and types of schedule – hub & spoke scheduling, advantages/ disadvantages & preparing flight plans – Aircraft scheduling in line with aircraft maintenance practices.

UNIT-IV AIRCRAFT RELIABILITY
Aircraft reliability – The maintenance schedule & its determinations – Condition monitoring maintenance – Extended range operations (EROPS) & ETOPS – Ageing aircraft maintenance production.

UNIT-V TECHNOLOGY IN AIRCRAFT MAINTENANCE

TEXT BOOKS

REFERENCES
2. Wilson & Bryon, “Air Transportation”.
3. Philip Locklin D, “Economics of Transportation”.
LIST OF EXPERIMENT

1. Aircraft “Jacking Up” procedure
2. Aircraft “Leveling” procedure
3. Control System “Rigging check” procedure
4. Aircraft “Symmetry Check” procedure
5. “Flow test” to assess of filter element clogging
6. “Pressure Test” To assess hydraulic External/Internal Leakage
7. “Functional Test” to adjust operating pressure
8. “Pressure Test” procedure on fuel system components
9. “Brake Torque Load Test” on wheel brake units
10. Maintenance and rectification of snags in hydraulic and fuel systems.
AE-805
MAJOR PROJECT

The objective of the project work is to enable the students in convenient groups of not more than 4 members on a project involving theoretical and experimental studies related to the Aeronautical branch of study. Every project work shall have a guide who is the assigned faculty member of the institution. Each student shall finally produce a comprehensive report covering background information, literature survey, problem statement, project work details and conclusion. This final report shall be typewritten form as specified in the guidelines. The continuous assessment shall be made as prescribed by the regulation.
AE-807
SEMINAR & GROUP DISCUSSION

Objective of GD and seminar is to improve the mass communication and convincing / understanding skills of students and it is to give student an opportunity to exercise their rights to express themselves. Evaluation will be done by assigned faculty based on group discussion and power point presentation.
AE-806
Energy Conversion Lab

LIST OF EXPERIMENT

- Study of direct and diffused beam solar radiation
- Study of greenhouse effect
- Performance evaluation of solar flat plate collector
- External flow over Ahmed body
- Performance evaluation of solar funnel