EVALUATION SCHEME & SYLLABUS FOR

B. TECH. III YEAR
AERONAUTICAL ENGINEERING

ON

CHOICE BASED CREDIT SYSTEM (CBCS)

[Effective from the Session: 2018-19]
### Department Electives-1 Courses:

1. RAE051 - Introduction to Aerospace Propulsion
2. RAE 052 - Space flight Mechanics
3. RAE053 – Air Navigation
4. RAE054 - Unconventional Manufacturing Process.
<table>
<thead>
<tr>
<th>S. No.</th>
<th>Subject Code</th>
<th>Subject Name</th>
<th>Teaching Department</th>
<th>L-T-P</th>
<th>Theory / Lab Marks</th>
<th>Test</th>
<th>Assignment / Attendance</th>
<th>Total</th>
<th>Credit</th>
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<td>1</td>
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<td>Industrial Management</td>
<td>Applied Science</td>
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<td>Applied Science</td>
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<td>AE</td>
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<td>Design of Aircraft Elements &amp; Simulation Lab</td>
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**TOTAL 1000 24**

**Department Electives-2 Courses:**
1. RAE061- Jet Aircraft Propulsion
2. RAE062- Composite Material & Structure
3. RAE063- Aircraft material & Non-Destructive Testing
4. RAE064- Aircraft Evaluation
UNIT-1
Introduction to Heat Transfer:

Conduction:
General differential heat conduction equation in the rectangular, cylindrical and spherical coordinate systems. Initial and boundary conditions.

Steady State one-dimensional Heat conduction:
Simple and Composite Systems in rectangular, cylindrical and spherical coordinates with and without energy generation; Concept of thermal resistance. Analogy between heat and electricity flow; Thermal contact resistance and over all heat transfer coefficient; Critical radius of insulation.

UNIT-2
Fins:
Heat transfer from extended surfaces, Fins of uniform cross-sectional area; Errors of measurement of temperature in thermometer wells.

Transient Conduction:
Transient heat conduction; Lumped capacitance method; Time constant; Unsteady state heat conduction in one dimension only, Heisler charts.

UNIT-3
Forced Convection:
Basic concepts; Hydrodynamic boundary layer; Thermal boundary layer; Analogy between momentum and heat transfer in turbulent flow over a flat surface; Mixed boundary layer; Flow over a flat plate; Flow across a single cylinder and a sphere; Flow inside ducts; Empirical heat transfer relations;

Natural Convection:
Physical mechanism of natural convection; Buoyant force; Empirical heat transfer relations for natural convection over vertical planes and cylinders, horizontal plates and cylinders, and sphere, Combined free and forced convection.

UNIT-4
Thermal Radiation:
Basic radiation concepts; Radiation properties of surfaces; Black body radiation Planck’s law, Wein’s displacement law, Stefan Boltzmann law, Kirchoff’s law; Gray body; Shape factor;
Black-body radiation; Radiation exchange between diffuse non black bodies in an enclosure; Radiation shields; Radiation combined with conduction and convection; Absorption and emission in gaseous medium; Solar radiation; Greenhouse effect.

UNIT-5
Heat Exchanger:
Types of heat exchangers; Fouling factors; Overall heat transfer coefficient; Logarithmic mean temperature difference (LMTD) method; Effectiveness-NTU method; Heat transfer enhancement (augmentation) methods.

Condensation and Boiling:
Introduction to condensation phenomena; Heat transfer relations for laminar film condensation on vertical surfaces and on outside & inside of a horizontal tube; Effect of non-condensable gases; Dropwise condensation; Heat pipes; Boiling modes, pool boiling; Two phase flow and heat transfer.

Introduction to Mass Transfer:
Introduction; Fick's law of diffusion; Steady state equimolar counter diffusion; Steady state diffusion though a stagnant gas film. Combined heat and mass transfer Micro scale and nano scale heat & mass transfer.

Books and References:

1. Fundamental of Heat and mass transfer, by Incroperra & De witt John wiley sons.
3. Heat and Mass Transfer by Rudramoorthy and Mayilsamy, Pearson Education.
UNIT-1  8
Electronic Instrument System: Typical system arrangement and cockpit layout of Electronics instrument systems. Numbering System: binary, octal and hexadecimal: Demonstration of conversion between the decimal And binary, octal and hexadecimal systems and vice versa. Logic Circuits: Identification of common logic gate symbols and equivalent circuits. Application used for aircraft systems.

UNIT-2  8
Data Conversion: Analogue Data, Digital Data: Operation and application of analogue to digital, and digital to analogue converters, inputs and outputs, limitations of various types Data Buses: Operation of data buses in aircraft systems, including knowledge of ARINC and other specifications. schematic diagrams. Interpretation of logic diagrams.

UNIT-3  9
Microprocessors: Functions performed and overall operation of a microprocessor. Basic operation of each of the following microprocessor elements: control and processing unit, clock, register, arithmetic logic unit. Integrated Circuits, Operation and use of encoders and decoders; Function of encoder types; Uses of medium, large and very large scale integration. Multiplexing. Operation, application and identification in logic diagrams of multiplexers and DE multiplexers.

UNIT-4  9
Fiber Optics: Advantages and disadvantages of fiber optic data transmission over electrical wire propagation: Fiber optic data bus, Fiber optic related terms, Termination, Couplers, control terminals, remote terminals. Application of fiber optics in aircraft systems.

UNIT-5  10


Books and References:
UNIT-1 8
Introduction: Definition, Design requirements of machine elements, Design procedure, Standards in design, Selection of preferred sizes, Indian Standards designation of carbon & alloy steels, Selection of materials for static and fatigue loads.
Design for Static and Fluctuating Loads: Modes of failure, Factor of safety, Principal stresses, Stresses due to bending and torsion, Theory of failure. Cyclic stresses, Fatigue and endurance limit, Stress concentration factor, Stress concentration factor for various machine parts, Notch sensitivity, Design for finite and infinite life, Soderberg & Goodman & Gerber criteria.

UNIT-29
Riveted Joints: Riveting methods, materials, Types of rivet heads, Types of riveted joints, Caulking and Fullering, Failure of riveted joint, Efficiency of riveted joint, Design of boiler joints, Eccentric loaded riveted joint.
Keys and Shafts: Cause of failure in shafts, Materials for shaft, Stresses in shafts, Design of shafts subjected to twisting moment, bending moment and combined twisting and bending moments, Shafts subjected to fatigue loads, Design for rigidity. Types of keys, splines, Selection of square & flat keys, Strength of sunk key.

UNIT-39
Helical Gears: Terminology, Proportions for helical gears, Forces components on a tooth of helical gear, Virtual number of teeth, Beam strength & wear strength of helical gears, Dynamic load on helical gears, Design of helical gears.

UNIT-4 8
Bevel and Worm Gears: Terminology of bevel gears, Force analysis, Virtual number of teeth, Beam strength and wear strength of bevel gears, Effective load of gear tooth, Design of a bevel gear system. Types of worms, Terminology, Gear tooth proportions, Efficiency of worm gears, Heat dissipation in worm gearing, Strength and wear tooth load for worm gears, Design of worm gearing system.

UNIT-510
Rolling Contact Bearing
Types of ball bearing, Thrust ball bearing, Types of roller bearing, Selection of radial ball bearing, bearing life, Selection of roller bearings, Dynamic equivalent load for roller contact bearing under constant and variable loading, Reliability of Bearing, Selection of rolling contact bearing, Lubrication of ball and roller bearing. Advantages and disadvantages.

Note: Design data book is allowed in the examination.

Books and References:
5. Design of Machine Elements, Sharma and Purohit, PHI.
UNIT-1

Introduction: Course Intro & Historical development of flights Early development of aircraft propulsive devices Development of Jet propulsion for aircraft Introduction to thermodynamics, Scope and method, Basic concepts: system, surroundings, property, intensive and extensive, state, equilibrium and state postulate, process, path and cycle Quasi-static processes, zeroth law of thermodynamics and temperature, concept of energy and its various forms, internal energy, enthalpy Specific heats at constant pressure and volume Work and heat transfers.

UNIT-2


UNIT-3


UNIT-4


UNIT-5

Combustion in S.I. Engine: Normal combustion in S.I. engine, Auto ignition of end charge, Knock and detonation, Pre-ignition and post-ignition. Pressure-specific volume (p.v.) and pressure- time (p.t.) diagrams for normal combustion. P.T. and rate diagrams with detonation. Effect of engine operating variables on knock, Knock rating of S.I. Fuels, Antiknock agents,
Knock and S.I. engine performance.

**Ignition:** Ignition timing and performance. Effect of ignition timing on output. Factors effectingspark advance. Ignition timing and cylinder temperature. Location of spark plug, battery ignition system. Magneto ignition Aircraft engine plugs. Altitude effects on ignition apparatus.

**Books and References:**

UNIT- 1

UNIT- 2

UNIT- 3

UNIT –4

UNIT- 5

Books and Reference:
UNIT-1
8

UNIT-2
8
Magnetism: Review of the Elementary laws of magnetism, Terrestrial magnetism, Horizontal and vertical components of earth's magnetic field and their variation with latitude. Isogonic and agonic lines. Isoclinic lines. Aircraft Magnetism, Resolution into P.Q. and R components, coefficients and deviation associated with them, compass course deviation.

UNIT-3
8
Chart Reading: Distinctive Properties of Charts, The importance of chart reading, Topographic Information Aeronautical Data, Legend and written Notes, The practice of Chart Reading.
Dead Reckoning: The place of Pilotage, Advantage of Dead Reckoning, Basic Problems in Dead Reckoning.
Special Problems & Dead Reckoning: Climb and Descent, off course corrections, Double Drift. Radius of Action, Cruise Control, Alternate Airport Problem, Interception, Tracking.
Air Navigation Computers: Function and Usefulness, the Slide' Rule Side the Wind Triangle Side.

UNIT-4
8

UNIT-5
8
Celestial Navigation: Elements of Astronomy, the universe, Solar system, movements of earth, moon and planets, earth's orbit' Kepler laws, declination, altitude, azimuth etc. Practical Value, Accuracy, Simplicity, Basic principles, The Line of position, Celestial Coordinates,


**Books and References:**

6. Martin, Air Navigation
UNIT-18


UNIT-2

Unconventional Machining Process: Principle and working and applications of unconventional machining process such as Electro-Discharge machining, Electro-chemical machining, ultrasonic machining, Abrasive jet machining etc.

UNIT-3

Unconventional Machining Process (continued): Principle and working and application of unconventional machining processes such as Laser beam machining, Electron beam machining, Ultrasonic machining etc. (these can also be used for welding).

UNIT-4

Unconventional welding processes: Explosive welding, Cladding etc. Under water welding, Metalizing, Plasma arc welding/cutting, gas welding / cutting & Resistance Arc welding etc.

UNIT-5

Unconventional Forming process: Principle, working and applications of High energy forming process such as Explosive Forming, Electromagnetic forming, Electro-Discharge forming, water hammer forming, explosive compaction etc.

Books and References:

1. Modern Machining Processes - P.C. Pandey
2. Unconventional Machining - V.K. Jain.
Minimum 8 out of following such Experiments (or such Experiments)

1. Conduction – Experiment on Composite plane wall
2. Conduction – Experiment on Composite cylinder wall
3. Conduction - Experiment on critical insulation thickness
4. Conduction – Experiment on Thermal Contact Resistance
5. Convection - Pool Boiling experiment
6. Convection - Experiment on heat transfer from tube-(natural convection).
10. Convection - Determination of thermal conductivity of fluid
11. Experiment on Stefan's Law, on radiation determination of emissivity, etc.
12. Experiment on solar collector, etc.
13. Heat exchanger - Parallel flow experiment
14. Heat exchanger - Counter flow experiment
1. Safety precaution associated with radio equipment hazards: high voltage, RF emission and microwave emissions, Electrostatic discharge etc.
2. Wiring and cabling demonstration and practice in radio circuits.
5. Identification and inspection of antenna: external wire aerials, blade, rod and rail aerials:
6. D/F loops and suppressed aerials viewing on A/C and inspection for physical condition. Aerial masts, static discharger’s etc. inspection and servicing.
7. To demonstrate the measurements TRF receiver, intermediate frequency and amplifier Frequency convertor.
8. Super heterodyne alignment Buffer amplifier and RF amplifier.
9. To demonstrate Modulation and demodulation.
10. To study of Interference (filtering and shielding) Troubleshooting Practices.
11. To study the working of Bourdon Pressure Gauge and to check the calibration of the gauge in a dead-weight pressure gauge calibration set up.
12. To measure static/dynamic pressure of fluid in pipe/tube using pressure transducer/pressure cell.
13. Vibration measurement by Dual Trace Digital storage Oscilloscope.
14. To study of the transmission losses by a given transmission line by applying capacitive /inductive load.
Minimum 10 out of following such Experiments (or such Experiments)

1. To demonstrate the longitudinal, lateral and directional stability.
2. To demonstrate the effect of roll control: ailerons and spoilers:
3. To demonstrate the effect of pitch control: elevators and horizontal stabilators.
4. To demonstrate the effect of yaw control, rudder limiters:
5. To demonstrate the effect of pitch control variable incidence stabilizers and canards.
6. To demonstrate the effect of high lift devices: slots, slats, flaps
7. To demonstrate the effect of drag inducing devices: spoilers, lift dumpers, speed brakes:
8. To demonstrate the effect operation and effect of trim tabs, servo tabs, control surface bias.
9. To demonstrate the effect operation with stall protection system
10. To demonstrate the effect with aircraft major components on aircraft and to identify their location.
11. To demonstrate the effect with aircraft structure fuselage station, wing station number
12. To demonstrate the effect operation understand and test electrical bonding on aircraft
13. To demonstrate the effect operation with manual system operation
14. To demonstrate the effect operation with hydraulic actuator
UNIT-1

Introduction, mechanisms and machines, kinematics and kinetics, types of links, kinematic pairs and their classification, types of constraint, degrees of freedom of planar mechanism, Grubler’s equation, mechanisms, inversion of four bar chain, slider crank chain and double slider crank chain.

Velocity analysis:
Introduction, velocity of point in mechanism, relative velocity method, velocities in four bar mechanism, instantaneous center.

Acceleration analysis:
Introduction, acceleration of a point on a link, acceleration diagram, Cariole’s component of acceleration, crank and slotted lever mechanism.

UNIT-2

Cams
Introduction, classification of cams and followers, cam profiles for knife edge, roller and flat faced followers for uniform velocity, uniform acceleration,

Gears and gear trains
Introduction, classification of gears, law of gearing, tooth forms and their comparisons, systems of gear teeth, length of path of contact, contact ratio, minimum number of teeth on gear and pinion to avoid interference, simple, compound, reverted and planetary gear trains, sun and planet gear train.

UNIT-3

Force analysis:
Static force analysis of mechanisms, D’Alembert’s Principle, dynamics of rigid link in plane motion, dynamic force analysis of planar mechanisms, piston force and crank effort. Turning moment on crankshaft due to force on piston, Turning moment diagrams for single cylinder double acting steam engine, four stroke IC engine and multi-cylinder engines, Fluctuation of speed, Flywheel.

UNIT-4

Balancing:
Introduction, static balance, dynamic balance, balancing of rotating masses, two plane balancing, graphical and analytical methods, balancing of reciprocating masses,

Governors:
Introduction, types of governors, characteristics of centrifugal governors, gravity controlled and spring controlled centrifugal governors, hunting of centrifugal governors, inertia governors. Effort and Power of governor.
UNIT-5

Brakes and dynamometers:
Introduction, Law of friction and types of lubrication, types of brakes, effect of braking on rear and front wheels of a four wheeler, dynamometers, belt transmission dynamometer, torsion dynamometer, hydraulic dynamometer.

Books and References:

UNIT-110


UNIT-29


UNIT-38


UNIT-410


Sear Flow in Closed Sections- Brédt-Batho theory – single-cell and multi-cell tubes subject to torsion. Shearflow distribution in thin-walled single & multi-cell structures subject to combined
bending torsion with walls effective and ineffective in bending. Shear resistant web beams-Torsion field web beams.

UNIT-5  8
Buckling in Beam & Plates- Euler buckling of columns and beams inelastic stability of columns, effect of initial imperfections, energy method for the calculation of buckling loads in columns and thin plates. Flexural and tensional buckling in the thin walled columns. Buckling stress of thin walled sections, crippling strength estimation. Buckling in stiffened rectangular sheets under compression.

Books and Reference:

7. E.E. Sechler & L, Dunn, Airplane Structural Analysis & Design, Wiley & Sons Ltd,
15. M.F. Rubinstein, Matrix computer Analysis of Structures, Prentice Hall 1966
17. J. W Dallyand, W,F Riley Experimental Stress Analysis, Mc Graw Hill 1965
RAE- 602: AERODYNAMIC-I

UNIT-1

UNIT-2

UNIT-3

UNIT-4
3-D Wings Theory- Vortex system around wing, horse shoe vortex. Helmholtz’s theorems, Biot Savart's law, Induced velocity (Downwash) of infinite, semi-infinite and finite filaments. Prandtl's classical lifting line theory, fundamental equations, elliptic lift distribution, influence of aspect ratio on lift and drag, drag polar and lift correlation to aspect ratio. Techniques for general span wise distribution, calculation of lift and vortex induced drag, numerical problems based on above. Panel methods: General description of the panel methods.

UNIT-5

Books and References:
6. D.O. Dommasch, S.S. Sherby & T.F. Connolly, Airplane Aerodynamics, Sir,
Department Elective -2

RAE-021: JET AIRCRAFT PROPULSION

UNIT-18


UNIT-28

Euler turbine equation and its different forms, velocity triangles for a generalized turbo-machine degree of reaction in turbo machines, methods of representing velocity diagrams. Velocity triangle for a stage radial equilibrium, free vortex, forced vortex and constant reaction designs; variation of blade height for the above types of blades, allowable temperature and pressure rise per stage; blade nomenclature, pressure loss coefficient, lift and drag, losses in blade passages, stall and surge, simple design examples.

UNIT-3 8


UNIT-4 8


UNIT-5 8

Fuel injection and control systems. Fuel injection atomization in simplex and duplex burners. All type of C-D Nozzles fixed and variable geometry, their operations characteristics at various altitudes and speeds their uses and Subsonic, Transonic, Supersonic Intake Designs.

Books and Reference -
1. Mechanics and Thermodynamics of Propulsion by Hill and Peterson,
2. Jet Propulsion for Aerospace Application by Hesse and Mumford,
3. Aircraft and Missile Propulsion by M.J, Zucrow, Vols, I and it,
4. The theory and Design of Gas Turbines and Jet Engines by E.T, Vincent,
5. Gas Turbine Theory by H, Cohen and G,F,C, Rogers,
UNIT-1  8


UNIT-2  8


UNIT-3  8


UNIT-4  8


UNIT-5  8


Books and Reference:

4. E.E. Sechler& L.G, Dunn, Airplane Structural Analysis & Design , Wiley & Sons Ltd,
5. F.E. Bruhn Analysis & Design of Flight Vehicle Structures, Tristate offset Co, 1965
RAE -023: AIRCRAFT MATERIALS & NON DESTRUCTIVE TESTING

UNIT-1


Furnishing Materials: Plastic, wood, plywood, glue, dopes and rubber used in aircraft manufacture. Paints, surface finishes and materials.

UNIT-2


UNIT-3


UNIT-4

Importance of NDT in quality assurance. Different types of non-destructive techniques to obtain information regarding size, location and orientation of damage or cracks. Visual inspection techniques coin tapping technique for composite structures and adhesive bonds. Ultrasonic testing: Pulse echo technique, pitch-catch technique, through transmission technique, A-scan B-Scan the methods of NDT and highlight its role in quality assurance. The emphasis should also be on its application during the process of design, manufacturing and maintenance.

UNIT-5


In each of the above techniques-
(i) Theory and basic principles, (ii) advantages/disadvantages, (iii) material of parts that can be inspected, (iv) Physical size and shape limitation, (v) economics of process, (vi) types of defects that can be detected, (vii) environment limitation are to be discussed along with equipment used for each of the techniques.
Books and References:

1. S K HajraChowdhary, Materials, Science and Engineering Processes, Media Promoters
2. George E. F. Titterton, Aircraft Materials, English Book Stores, Delhi
7. NDT and Ultrasonic Testing for Aircraft, FAA-AC 43-3
UNIT-1  8
Aerodynamics & performance: International Standard Atmosphere and its significance pressure and density altitudes. Compressibility effect, Mach number and its variation with altitude and temperature Take-off and landing, single engine performance at altitude, climb and descent performance at altitude, Effect of horizontal speed during climb and decent on performance and economics , Cruise performance cruise at constant speed (or Mach No.) Constant altitude, constant angle of attack and their effect on block speed and economics Noise criteria regulatory requirements regarding noise inside the passenger cabin and at near aircraft.

UNIT-2  8

UNIT-3  8
Aircraft Scheduling: Factor affecting airlines schedules, Commercial operation, Technical Metro logical, Airport Facilitation- run –way Strength and related requirements, Load Classification. Criteria for runaway and aircraft, Air Traffic Control and other number and other ground Communication /navigation facilities-their relationship and effect on related aircraft equipment Airport emergency Facilities – Firefighting, First Aid etc. Total take-off weight Balance diagram, calculation of c.g. and it’s variation due to variation pay load and consumables.

UNIT-4  8
Performance Estimation: Power / Thrust availed and required Effect of altitude and forward speed on engine performance and power / thrust required, Level Flight performance, maximum minimum and optimum speeds, maximum range and endurance, Maximum rate of climb and its variation with altitude, Absolute and service ceilings, takeoff and landing distances, Effect of ambient temperature and wind on landing and takeoff distances, One engine take off for multi-engine civil air planes.

Longitudinal Stability- Preliminary calculations of horizontal tail setting, Static stability and static margin, V-N Diagram: Gust and maneuverability envelope.

UNIT-5  8
**Principles of Aerodynamic Testing:** Brief history of the development of different types of Aerodynamic testing facilities, Drop tests, Rotating f tests. low speeds high sub- sonic speed transonic supersonic and hyper – sonic wind tunnels. Wind tunnel types according to fabrications. Description and principle of operation, types of mode tests possible areas of application and limitations of each of the facilities. Basic principles of flight testing and performance reduction.

**Books and Reference:**

1. G. Corning, Supersonic and Subsonic Airplane Design, Boz No, 14, College park , Maryland, 196,
3. A. Lebedinski, Lecture notes on Aircraft Design Department of Aeronautical Engineering, Indian Institute of Science, Bangalore
7. I.H. Abott& A,F, Von Doenhoff, Theory of Wing Section, Dover Publication Inc, 1959,
Minimum 8 out of following such Experiments (or such Experiments)

1. Study of simple linkage models/mechanisms
2. Study of inversions of four bar linkage
3. Study of inversions of single/double slider crank mechanisms
4. Experiment on Gears tooth profile, interference etc.
5. Experiment on Gear trains
6. Experiment on longitudinal vibration
7. Experiment on transverse vibration
8. Experiments on dead weight type governor
9. Experiment on spring controlled governor
10. Experiment on critical speed of shaft
11. Experiment on gyroscope
12. Experiment on static/dynamic balancing.
13. Experiments on Break
14. Experiments on clutch.
Minimum 10 out of following such Experiments (or such Experiments)

1. Determination of young’s modulus for metallic materials
2. Determination of flexural strength of metallic materials.
3. Determination of deflection of a simply-supported beam
4. Determination of deflection of a cantilever beam.
5. Verification of superposition theorem
6. Buckling load estimation of slender eccentric columns
7. Determination of flexural rigidity of composite beams
8. Determination of Shear failure of bolted and riveted Joints
9. Determination of Truss and frame analysis.
11. Determination of combined bending and Torsion of a Hollow Circular Tube.
12. Determination of shear Centre of a Channel Section and I section.
13. Fabrication of a Composite Laminate.
14. Determination of Tension field beam.
15. Study of non-destructive testing procedures.
17. Forced Vibration of a cantilever Beam.
Minimum 10 out of following such Experiments (or such Experiments)

1. To demonstrate the constructional arrangement and operation of turbojet and turbo-fan.
2. To demonstrate the constructional arrangement and operation of turboprop and turbo-shaft.
3. Recognition of visual defects of jet engines.
4. To demonstrate the operating principal 2-stroke and 4-strock CI engines.
5. To demonstrate the operating principal 2-stroke and 4-strock SI engines.
6. To demonstrate the operating principal of air cooled and water cooled piston engines.
7. To demonstrate the engine configuration and firing order.
8. To demonstrate the working of engine starting systems.
9. To demonstrate the installation and removal procedure of propellers.
10. To demonstrate operation of fixed and variable pitch propellers.
11. To demonstrate operation of turbine blades to turbine disc.
12. To demonstrate the working of exhaust gas temperature measurement system.
13. Calculate the cylinder area, sweep area and compression ratio for CI engine.
14. Test the on piston engine determine: Specific fuel consumption, Break horse power, Indicated horse power for four stroke petrol engine.
15. Test the on piston engine determine: Break thermal efficiency, Mechanical efficiency. Volumetric efficiency for four stroke petrol engine.
16. To determine Velocity and pressure measurements in co-axial jets.
17. To steady of Wall pressure distribution in subsonic diffusers.

To steady of Flame stabilization studies using conical flame holders
1. Design of Aircraft components subjected to combined steady and variable loads
2. Design of eccentrically loaded riveted joint.
3. Design and drafting of riveted joints
4. Design and drafting of lap joint and butt joints
5. Design of shaft for combined constant twisting and bending loads
7. Design and drafting control components gear.
8. Understand layout of typical wing structure.
9. Understand layout of typical fuselage structure.
10. Understand layout of typical control system
11. Understand computer added modeling of layout of typical wing structure
12. Understand computer added modeling of layout of typical fuselage structure.
13. Understand computer added modeling of layout of typical control system
14. Understand computer added modeling of layout of typical landing gear.
15. Three view diagram of a typical aircraft