SYLLABUS

For

B.Tech Aeronautical Engineering
Semester - III &IV

Aeronautical Engineering Syllabus

B TECH (THIRD SEMESTER)

SVNUAE 301	**Fluid Mechanics**
SVNUAE 302	**Strength of Materials**
SVNUAE 303	**Aero Engineering Thermodynamics**
SVNUAE 304	**Computing Skills & software Development**
SVNUAE 305	**Materials of science**
SVNUAE 306	**Advanced Engineering Mathematics**

B TECH (FOURTH SEMESTER)

SVNUAE 401	**Introduction to Aeronautics**
SVNUAE 402	**Aircraft Instruments and principles**
SVNUAE 403	**Control Systems principles and design**
SVNUAE 404	**fundamentals of Aerodynamics I**
SVNUAE 405	**Analysis of AirCraft Structure I**
SVNUAE 406	**Mechanics Of Machines**

SVNUAE-THIRD SEMESTER
301 FLUID MECHANICS

UNIT - 1

Basic Definitions and Fluid Properties ; Definition of Fluid, Incompressible and compressible fluids, Fluid as a continuum, Mass, Density, specific weight, relative density, specific volume, Bulk modulus, velocity of sound Ideal fluid Viscosity. Newtonian and Non - Newtonian fluid, Kinematics' viscosity, Effect of temperature and pressure on viscosity, surface tension capillarity, vapour pressure and cavitation. Fluid Statics : General differential equation, Hydrostatics Manometry, Fluid forces on submerged surfaces. Curved surfaces, Aerostatics, Isothermal atmosphere, polytropic atmosphere. The international standard atmosphere, static stability The international standard atmosphere submerged bodies. Floating bodies.

UNIT - 2

Kinematics and conservation of Mass : Flow classifications. Fluid velocity and acceleration, streamlines and the stream function. Pathlines and streak lines. Deformation of a fluid element, verticity and circulation. Irrotational and Rotational flow. Flownet, Laplace equation. Conservation of mass and the continuity equation for three dimensions. Fluid Momentum : The Momentum theorem Applications of the momentum theorem Equation of motion, Euler's equation of motion Integration of Euler's equation of motion. Bernoulli's equation. Applications of Bernoulli's Pitot tube, Equation of motion for Viscous fluid, Navier Stoke's equation.

UNIT - 3

Orifice discharging free, Jet, vena contracts, co-efficient of contraction, velocity and discharge, coefficient of resistance. Orifices and mouthpieces Nozzles and weires. Flow Through Pipes : Reynold's experiment Darcy's Weisback equation. Loss of head due tosudden enlargements, contraction, entrance, exit obstruction, bend, pipe fittings. Total and Hydraulic grandient lines, Flow through pipe line. Pipes in series, parallel Transmission of power through pipes.

UNIT - 4

Laminar Flow: Simple solution of Navier Stokes equations. Hagen – Poiseuille flow. Plans Poiseuille flow and coutte flow. Turbulent Flow; Variation of friction factor with Reynold's number. The Prandt Mixing length hypothesis applied to pipe flow, velocity distribution in smooth pipes, sough pipes. The Universal pipe friction laws, Colebrook. White formula. Dimensional Analysis: Buckingham variables, Model Similitude, Force ratio, Reynolds, Froude's Mach, Weber and Euler numbers and their applications. Undistorted model distorted model scale effect.

UNIT - 5

The Boundary Layer: Description of the boundary layer. Boundary Layer thickness boundary layer separation and control. The Prandtl boundary layer equation. Solution for cominar boundary layer. The momentum equation for the boundary layer. The flat plate in uniform free stream with no pressures gradients. Approximate momentum analysis laminar boundary Aerofoils Theory. Flow round a body ; Drag skin friction drag, pressure drag, combined skin friction & pressure drag (Profile drag) wave drag, lift induced drag. Flow past sphere & Cylinder.

References

1. Engineering Fluid Mechanics : K.L.Kumar, Eurasia Publishing House Pvt Ltd
2. Fluid Mechanics and Machines : F.M. White ,John Wiley & Sons
3. Fluid Mechanics and Machines: A.K. Jain
4. Fluid Mechanics: V.L. Streeter, Mc Graw Hill
5. Fluid Mechanics and Hydraulic Machines: R.K. Bansal, Laxmi Publication New Delhi
6. Fluid Mechanics With Applications : S.K.Gupta V.Gupta, New Age Publications
7. Fluid Mechanics for Chemical engineers : Noel de Nevers ,Mc Graw HillII Edition 1991
8. Fluid mechanics for chemical engineers: James O wikes and Stacy G Bikes, Prentice Hall PTR (International seriesin chemical engineering)1999

302 Strength of materials

Unit – 1

Stress & strain: Tension, compression, shearing stress & strain; Poisson's ratio: Stress-strain relationship, Hooke's law; equations of static = w for 2D & 3D cars Elastic constants and their relations for a isotropic hookean material, anisotropy & orthotropy, thermal stresses, composite bars; simple elastic, plastic & visco-elastic behavior of common materials in tension and compression test, stress- strain curves. Concept of factor of safety & permissible stress. Conditions for equilibrium. Concept of free body diagram; Introduction to mechanics of deformable bodies.

Unit – 2

Members subjected to flexural loads: Theory of simple bending, bending moment and shear force diagrams for different types of static loading and support conditions on beams. Bending stresses, Section modulus and transverse shear stress distribution in circular, hollow circular, I, Box, T, angle sections etc.

Unit – 3

Principal planes, stresses & strains: Members subjected to combined axial, bending & Torsional loads, maximum normal & shear stresses; Concept of equivalent bending & equivalent twisting moments:

Mohr's circle of stress & strain.

Theories of Elastic Failures: The necessity for a theory, different theories, significance and comparison, applications.

Unit – 4

Torsion: Torsional shear stress in solid, hollow and stepped circular shafts, angular deflection and power transmission capacity.

Stability of equilibrium: Instability & elastic stability. Long & short columns, ideal strut, Euler's formula for crippling load for columns of different ends, concept of equivalent length, eccentric loading, Rankine formulae and other empirical relations.

Unit – 5

Transverse deflection of beams: Relation between deflection, bending moment, shear force and load, Transverse deflection of beams and shaft under static loading, area moment method, direct integration method: method of superposition and conjugate beam method. Variational approach to determine deflection and stresses in beam.

Elastic strain energy: Strain energy due to axial, bending and Torsional loads; stresses due to suddenly applied loads; use of energy theorems to determine deflections of beams and twist of shafts.Castigliano's theorem. Maxwell's theorem of reciprocal deflections.

References

1. Strength of Materials : B.C Poonamia and ramamurtham, Dhanpatrai Publishers Delhi
2. Mechanics of solid : S.H.Crandell, N.C.Dahi and T.J. Lardner, Mc Graw Hill International Edition
3. Strength of Materials: G.H. Ryder, ELBS Publications co ltd
4. Elements of Strength of Material :J.P. Tinnoshnko and G.H.Young, Affiliated East west Press New Delhi
5. Solid Mechanic : GMA Kazmi, Tata Mc-Graw Hill Publishing Ltd., New Delhi Mc Graw Hill Publishing co Ltd New Delhi

303 AERO ENGINEERING THERMODYNAMICS

UNIT 1

Basic Concepts of Thermodynamics: Thermodynamics system, control volume, Properties, state, processes and cycle, equality of temperature, Zeroth Law of thermodynamics, temperature scale, laws of perfect gas, Pure substances, vapour-Liquid –solid-phase equilibrium in a pure substances, thermodynamic surfaces

UNIT 2

Work and heat, Law of conservation of mass and energy, First law of thermodynamics, steady state Processes, Second law of thermodynamics, Heat engine, Carnot cycle, thermodynamic temperature scale, entropy, change of entropy for different processes, equivalence of Kelvin plank and clausius statements, clausius inequality.

UNIT 3

Available and unavailable energy, availability of a non flow and steady flow system, Helmbeltz and Gibb's functions, Thermodynamic Relations: Important mathematical relations, Maxwell relations, Tds Relations, Joule- Thomson coefficient, Clayperon relation.

UNIT 4

Air – standard power cycle, Brayton cycle, Otto cycle, diesel cycle, Dual cycle, Stirling cycle, Ericssion cycle and Atkinson cycle, Mean effective pressure and efficiencies, Four stroke petrol and diesel engine, Two stroke Petrol and diesel engine.

UNIT 5

Properties of steam, phase change process, use of steam table & molier char. Rankine cycle, Reheat cycle, Regenerative cycle, cogeneration vapour compression refrigeration cycle.

References

1. Thermodynamics: P.K.Nag
2. Engg. Thermodynamics : Goyal

304 COMPUTING SKILLS & SOFTWARE DEVELPOPMENT

Unit 1

Computer software: Spreadsheets (e.g. Microsoft Excel, including Macros) Engineering Application (e.g. Engineering Evolution solver), a Mathematical Simulation package (e.g. MATLAB).Use of this software in analysis of simple Engineering system

Unit II

System analysis , system elements & characteristics, software development life cycle , software development process models (waterfall model , spiral model)

Unit III

Introduction to data structures, singly linked lists, doubly linked lists, circular list.

Unit IV

Trees- Binary trees, terminology, representation, traversals, graphs – terminology, representation graph traversals (dfs & bfs).

Unit V

Representing stacks and queues in c using arrays and linked lists, infix to post fix conversion, post fix expression evaluation.

References

1. D.S.A : (SCHAUM'S)
2. SOFTWARE ENGINEERING : (SHAHINI PURI)

305 MATERIALS OF SCIENCE

UNIT 1

Atomic structure of Metals: Crystal structure, crystal lattice of (i) Body centred cubic (ii) Face centred cubic (iii) Closed packed hexagonal, crystallographic Notation of atomic planes and Directions (Miller Indices), polymorphism and allotropy, Crystal imperfection.

UNIT 2

Theories of plastic deformation. Phenomenon of slip, twinning and dislocation. Identification of crystallographic possible slip planes and direction in FCC, BCC, HCP. Recovery and recrystallization, preferred orientation causes and effects on the property of metals.

UNIT3

Classification of engineering materials. Solidification of metals and of some typical alloys: Mechanism of crystallisation (I) nuclear formation (ii) crystal growth. General principles of phase transformation in alloys, phase rule and equilibrium diagrams, Equilibrium diagram of binary system having complete mutual solubility in liquid state and limited solubility in solid state, Binary isomorphous alloy system, Hume-Rothery rule, Binary system with limited solid solubility of terminal phase and in which solubility decreases with temperature and also alloy with a peritectic transformation. Equilibrium diagram of a system whose components are subject to allotropic change. Iron carbon Equilibrium diagram, phase transformation in the iron carbon diagram (I) Formation of Austenite (ii) Transformation of Austenite into pearlite (iii) Martensite transformation in steel, TTT curves.

UNIT 4

Engineering properties and their measurements, Principles and applications of annealing, normalising, hardening, tempering. Recovery and re-crystallization. Hardenability - its measures, variables, effecting Hardenability, methods, for determination of Hardenability. Over-heated, Burnt steel, its causes and remedies. Temper brittleness - its causes and remedies. Basic principles involved in heat treatment of plain carbon steel, alloy steels, cast iron and Non-ferrous metals and their alloys.

Chemical Heat treatment of steels: Physical principles involved in chemical heat treatment procedure for carburizing, Nitriding, Cyaniding, carbo-nitriding of steel.

UNIT 5

Effects produced by Alloying element on the structures and properties of steel Distribution of alloying elements (Si, Mn, Ni, Cr, Mo, Co, W, Ti, Al) in steel, structural classes of steel. Classification of steels, BIS Standards. Fibre reinforced plastic composites**:** Various fibres and matrix materials, basic composite manufacturing methods, applications of composite materials.

References

1.MATERIAL OF SCIENCE : (R.K. RAJPUT)
2. MATERIAL OF SCIENCE : (RAVI KUMAR GOYAL)

306 ADVANCED ENGINEERING MATHEMATICS

UNIT 1

Fourier series: Fourier series, Half-range series, Harmonic analysis. Integral Transforms: Fourier integral theorem, Fourier transforms, Convolution theorems, Inversion theorem for Fourier and Laplace transforms, Simple applications of these transforms to one-dimensional problems.

UNIT 2

Method of separation of variables - applications to the solution of wave equation in one dimension, laplace's equation in two dimensions, Diffusion equation in one dimension. Transform calculus : Laplace transform with its simple properties, applications to the solutions of ordinary and partial differential equations having constant co-efficient with special reference to wave and diffusion equation.

UNIT 3

Complex Variable: Functions of a complex variable; Exponential, trigonometric, hyperbolic and logarithmic functions; Differentiation, Analytic functions, Cauchy-Riemann equations, conjugate functions; Application to two dimensional potential problems; Conformal transformations, Schwartz- Christoffel transformation; Cauchy's Integral theorem. Taylor's and Laurent's expansions; Branch points, zeros, poles and residues; Simple problems on contour integration

UNIT 4

Boundary Value Problems: Equations for vibrations of strings, heat flow and electrical transmission lines; Laplace's equation in Cartesian, cylindrical polar and spherical polar coordinates; Solution by separation of variables. Solution in Series: Differentiation and integration of infinite series, Series solution of differential equations; Bessel and Legendre equations, their series solution, elementary properties of Bessel functions and Legendre polynomials

UNIT 5

Numerical Methods: Difference operators: forward, backward, central shift and average operators and relations between them.

Newton Backward and Interpolation; Lagrange's interpolation and the error formula for interpolation.Numerical differentiation and integration. Trapezoidal rule and Simpson's one-third rule including error formula

References

1.MATHEMATICS III : (GOKHUROO)
2. MATHEMATICS III : (ASHIRWAD)

PRACTICAL III SEM

301 STRENGTH OF MATERIALS LAB

LIST OF EXPERIMENTS

1. Izod Impact testing.
2. Rockwell Hardness Testing.
3. Spring Testing
4. Column Testing for buckling
5. Torsion Testing
6. Tensile Testing
7. Compression Testing
8. Shear Testing
9. Brinell Hardness Testing
10. Bending Test on UTM.
11. Study of Fatigue Testing Machine.

302 THERMODYNAMICS LABORATORY

LIST OF EXPERIMENTS

1. Performance test on a 4-stroke engine
2. Valve timing of a 4 – stroke engine and port timing of a 2 stroke engine
3. Determination of effectiveness of a parallel flow heat exchanger
4. Determination of effectiveness of a counter flow heat exchanger
5. Determination of the viscosity coefficient of a given liquid
6. COP test on a vapour compression refrigeration test rig
7. COP test on a vapour compression air-conditioning test rig
8. Study of a Gas Turbine Engine.
9. Determination of Conductive Heat Transfer Coefficient.
10. Determination of Thermal Resistance of a Composite wall.

303 FLUID MECHANICS AND MACHINERY LABORATORY

LIST OF EXPERIMENTS

1. Calibration of venturimeter
2. Pressure measurement with pitot static tube
3. Determination of pipe flow losses.
4. Verification of Bernoulli's theorem
5. Flow visualization by Heleshaw apparatus
6. Performance test on centrifugal pumps
7. Performance test on reciprocating pumps
8. Performance test on piston wheel turbine

9. Performance test on Francis turbine
10. Determination of Viscosity of a Fluid

304 COMPUTER PROGRAMMING LAB

List of programs in C:

1. Program for revising control statements, arrays and functions.
2. Program using string handling and various functions described in string.h, ctype.h.
3. Program using structures and sorting algorithm (Insertion, Selection, Quick, Heap sort) and functions described in math.
4. Program using file handling and related functions defined in stdio.h, io.h.
5. Program using pointers, array and pointers, pointers to structures, dynamic memory allocation.

List of Programs in C++

6. Program using basic I/O and control statements.
7. Program using class, objects, objects as function parameters.
8. Program using functions and passing reference to a function, inline functions. Program using Inheritance and virtual base class.
9. Program using pointers, arrays, dynamic arrays. Program using functions defined in ctype.h and string.h.
10. Program using constructors, destructors. Program using function and operator over loading List of program in C++ implementing Data Structures
11. Creating and managing (add, delete, print, insert) nodes of a Linked list.
12. Creating and managing (create, pop, push etc.) stacks and queues.

FOURTH SEMESTER

401 INTRODUCTION TO AERONAUTICS

1. HISTORICAL EVALUATION

Early airplanes, biplanes and monoplanes, Developments in aerodynamics, materials, structures and propulsion over the years.

2. AIRCRAFT CONFIGURATIONS

Components of an airplane and their functions. Different types of flight vehicles, classifications. Conventional control, Powered control, Basic instruments for flying, Typical systems for control actuation.

3. INTRODUCTION TO PRINCIPLES OF FLIGHT

Physical properties and structure of the atmosphere, Temperature, pressure and altitude relationships, Evolution of lift, drag and moment. Aerofoils, Mach number, Maneuvers.

4. INTRODUCTION TO AIRPLANE STRUCTURES AND MATERIALS

General types of construction, Monocoque, semi-monocoque and geodesic construction, Typical wing and fuselage structure. Metallic and non-metallic materials, Use of aluminium alloy, titanium, stainless steel and composite materials.

5. POWER PLANTS USED IN AIRPLANES

Basic ideas about piston, turboprop and jet engines, Use of propeller and jets for thrust production. Comparative merits, Principles of operation of rocket, types of rockets and typical applications, Exploration into space.

References

1. Anderson, J.D., “Introduction to Flight”, McGraw-Hill, 1995.

REFERENCE

1. Kermode, A.C., “Flight without Formulae”, McGraw-Hill, 1997.

402 AIRCRAFT INSTRUMENTS AND PRINCIPLES

1. AIRPLANE CONTROL SYSTEMS

Conventional Systems - Power assisted and fully powered flight controls - Power actuated systems – Engine control systems - Push pull rod system, flexible push full rod system - Components - Modern control systems - Digital fly by wire systems - Auto pilot system active control Technology, Communication and Navigation systems Instrument landing systems, VOR - CCV case studies.

2. AIRCRAFT SYSTEMS

Hydraulic systems - Study of typical workable system - components - Hydraulic system controllers - Modes of operation - Pneumatic systems - Advantages - Working principles - Typical Air pressure system – Brake system - Typical Pneumatic power system - Components, Landing Gear systems - Classification – Shock absorbers - Retractive mechanism.

3. ENGINE SYSTEMS

Fuel systems for Piston and jet engines, - Components of multi engines. lubricating systems for piston and jet engines - Starting and Ignition systems - Typical examples for piston and jet engines.

4. AUXILLIARY SYSTEM

Basic Air cycle systems - Vapour Cycle systems, Boost-Strap air cycle system - Evaporative vapour cycle systems - Evaporative air cycle systems - Oxygen systems - Fire protection systems, Deicing and anti icing systems.

5. AIRCRAFT INSTRUMENTS

Flight Instruments and Navigation Instruments – Gyroscope - Accelerometers, Air speed Indicators – TAS, EAS- Mach Meters - Altimeters - Principles and operation - Study of various types of engine instruments - Tachometers - Temperature gauges - Pressure gauges - Operation and Principles.

References

1. McKinley, J.L., and Bent, R.D., “Aircraft Maintenance & Repair”, McGraw-Hill, 1993.
2. “General Hand Books of Airframe and Powerplant Mechanics”, U.S. Dept. of Transportation, Federal Aviation Administation, The English Book Store, New Delhi1995.

REFERENCES

1. Mekinley, J.L. and Bent, R.D., “Aircraft Power Plants”, McGraw-Hill, 1993.
2. Pallet, E.H.J., “Aircraft Instruments & Principles”, Pitman & Co., 1993.
3. Treager, S., “Gas Turbine Technology”, McGraw-Hill, 1997.

403 CONTROL SYSTEMS PRINCIPLES AND DESIGN

1. INTRODUCTION

Historical review - Simple pneumatic, hydraulic and thermal systems, Series and parallel systems, Analogies - Mechanical and electrical components, Development of flight control systems.

2. OPEN AND CLOSED LOOP SYSTEMS

Feedback control systems – Block diagram representation of control systems, Reduction of block diagrams, Output to input ratios, Signal flow graph.

3. CHARACTERISTIC EQUATION AND FUNCTIONS

Lap lace transformation, 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.

4. CONCEPT OF STABILITY

Necessary and sufficient conditions, Routh – Hurwitz criteria of stability, Root locus and Bode techniques, Concept and construction, frequency response.

5. SAMPLED DATA SYSTEMS

Introduction to digital control system, Digital Controllers and Digital PID Controllers.

References

1. OGATO, “Modern Control Engineering”, Prentice – Hall of India Pvt. Ltd. New Delhi, 1998.
2. GOPAL.M. “Control Systems, Principles and design” – Tata McGraw-Hill Publication, New Delhi, 2000.
3. Azzo, J.J.D. and C.H. Houpis, “Feed back control system analysis and synthesis”, McGraw – Hill International, 3rd Edition, 1998.
4. Kuo, B.C., “Automatic control systems”, Prentice – Hall of India Pvt. Ltd., New Delhi, 1998.
5. Houpis, C.H. and Lamont, G.B., “Digital Control Systems”, McGraw-Hill Book Co. New York, USA 1995.
6. Naresh K. Sinha, “Control Systems”, New Age International Publishers, New Delhi

404 FUNDAMENTALS OF AERODYNAMICS – I

1. REVIEW OF BASIC FLUID MECHANICS

Continuity, momentum and energy equations.

2. TWO DIMENSIONAL FLOWS

Basic flows – Source, Sink, Free and Forced vortex, uniform parallel flow. Their combinations, Pressure and velocity distributions on bodies with and without circulation in ideal and real fluid flows. Kutta Joukowski's theorem.

3. CONFORMAL TRANSFORMATION

Joukowski transformation and its application to fluid flow problems, Kutta condition, Blasius theorem.

4. AIRFOIL AND WING THEORY

Joukowski, Karman - Trefftz, Profiles - Thin aerofoil theory and its applications. Vortex line, Horse shoe vortex, Biot and Savart law, Lifting line theory and its limitations.

5. VISCOUS FLOW

Newton's law of viscosity, Boundary Layer, Navier-Stokes equation, displacement, Momentum thickness, Flow over a flat plate, Blasins solution.

References

1. Anderson, J.D., "Fundamentals of Aerodynamics", McGraw-Hill Book Co., New York, 1985.

REFERENCES

1. Houghton, E.L., and Carruthers, N.B., "Aerodynamics for Engineering students", Edward Arnold Publishers Ltd., London, 1989.
2. Milne Thomson, L.H., "Theoretical aerodynamics", Macmillan, 1985.
3. Clancey, L.J., "Aerodynamics", Pitman, 1986

405 ANALYSIS OF AIRCRAFT STRUCTURES – I

1. STATICALLY DETERMINATE STRUCTURES

Analysis of plane truss – Method of joints – 3 D Truss - Plane frames

2. STATICALLY INDETERMINATE STRUCTURES

Composite beam - Clapeyron's Three Moment Equation - Moment Distribution Method.

3. ENERGY METHODS

Strain Energy due to axial, bending and Torsional loads - Castigliano's theorem - Maxwell's Reciprocal theorem, Unit load method - application to beams, trusses, frames, rings, etc.

4. COLUMNS

Columns with various end conditions – Euler's Column curve – Rankine's formula - Column with initial curvature - Eccentric loading – South well plot – Beam column.

5. FAILURE THEORY

Maximum Stress theory – Maximum Strain Theory – Maximum Shear Stress Theory – Distortion Theory – Maximum Strain energy theory – Application to aircraft Structural problems.

References

1. Donaldson, B.K., "Analysis of Aircraft Structures – An Introduction", McGraw-Hill, 1993.
2. Timoshenko, S., "Strength of Materials", Vol. I and II, Princeton D. Von Nostrand Co, 1990.

406 MECHANICS OF MACHINES

1. MECHANISMS

Machine Structure – Kinematic link, pair and chain – Grueblers criteria – Constrained motion – Degrees of freedom - Slider crank and crank rocker mechanisms – Inversions – Applications – Kinematic analysis of simple mechanisms – Determination of velocity and acceleration.

2. FRICTION

Friction in screw and nut – Pivot and collar – Thrust bearing – Plate and disc clutches – Belt (flat and V) and rope drives. Ratio of tensions – Effect of centrifugal and initial tension – Condition for maximum power transmission – Open and crossed belt drive.

3. GEARING AND CAMS

Gear profile and geometry – Nomenclature of spur and helical gears – Gear trains: Simple, compound gear trains and epicylic gear trains - Determination of speed and torque - Cams – Types of cams – Design of profiles – Knife edged, flat faced and roller ended followers with and without offsets for various types of follower motions

4. BALANCING

Static and dynamic balancing – Single and several masses in different planes – Balancing of reciprocating masses- primary balancing and concepts of secondary balancing – Single and multi cylinder engines (Inline) – Balancing of radial V engine – direct and reverse crank method

5. VIBRATION

Free, forced and damped vibrations of single degree of freedom systems – Force transmitted to supports – Vibration isolation – Vibration absorption – Torsional vibration of shaft – Single and multi rotor systems – Geared shafts – Critical speed of shaft.

References

1. Rattan.S.S, “Theory of Machines”, Tata McGraw–Hill Publishing Co, New Delhi, 2004.

2. Ballaney.P.L, “Theory of Machines”, Khanna Publishers, New Delhi, 2002.
3. Rao, J.S and Dukkipati, R.V, “Mechanism and Machine Theory”, Second Edition, Wiley Eastern Ltd., 1992.
4. Malhotra, D.R and Gupta, H.C., “The Theory of Machines”, Satya Prakasam, Tech. India Publications, 1989.
5. Gosh, A. and Mallick, A.K., “Theory of Machines and Mechanisms”, Affiliated East West Press, 1989.
6. Shigley, J.E. and Uicker, J.J., “Theory of Machines and Mechanisms”, McGraw-Hill, 1980.
7. Burton Paul, “Kinematics and Dynamic of Planer Machinery”, Prentice Hall, 1979.

PRACTICAL IV SEM
401 AERODYNAMICS LABORATORY

LIST OF EXPERIMENTS

1. Calibration of subsonic wind tunnel.
2. Pressure distribution over smooth and rough cylinder.
3. Pressure distribution over symmetric airfoils.
4. Pressure distribution over cambered airfoils & thin airfoils
5. Force measurement using wind tunnel balance.
6. Flow over a flat plate at different angles of incidence
7. Flow visualization studies in low speed flows over cylinders
8. Flow visualization studies in low speed flows over airfoil with different angle of incidence
9. Calibration of supersonic wind tunnel.
10. Supersonic flow visualization with Schlieren system.

402 DESIGN AND COMPUTER AIDED MODELING LAB

. **LIST OF EXERCISES**

1. Design of riveted joints (Lap joint).
2. Design of riveted joints (Butt joint with single and double straps).
3. Design of welded joints.
4. Layout of typical wing structure.
5. Layout of typical fuselage structure.
6. Computer aided modeling of typical aircraft wing.
7. Computer aided modeling of typical fuselage structure.
8. Computer aided modeling of landing gear
9. Three view diagram of a typical aircraft
10. Layout of control systems

403 AIRCRAFT STRUCTURES LAB –I

LIST OF EXPERIMENTS

1. Determination of Young's modulus of steel using mechanical extensometers.
2. Determination of Young's modulus of aluminum using electrical extensometers
3. Determination of fracture strength and fracture pattern of ductile materials
4. Determination of fracture strength and fracture pattern of brittle materials
5. Stress Strain curve for various engineering materials.
6. Deflection of beams with various end conditions.
7. Verification of Maxwell's Reciprocal theorem & principle of superposition
8. Column – Testing
9. South – well's plot.
10. Riveted Joints.

404 CONTROL LABORATORY

List of Experiments

1. Block diagram reduction technique
2. Block diagram formation for Control Systems.
3. Step Response of 2^{nd} order transfer function
4. Root Locus Plot
5. Bode Plot
6. Laplace & inverse laplace
7. Polar plot & Nyquist Stability Criterion
8. Hydraulic System
9. Convert Transfer function to State Space & Vice Versa
10. Calculate Observability & Controlability