

SEMESTER-IV

**MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.**

Semester: IV B.Tech
Subject: Numerical Methods

Branch: Aeronautical
Code: BT 450

Total Theory Periods: 48 Total Tutorial Periods: 00

Total Credits: 03

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

UNIT-I SOLUTION OF EQUATIONS & EIGEN VALUE PROBLEMS

Solution of algebraic and transcendental equations – Regula Falsi Method, Newton-Raphson method, iteration method. Solution of linear system of equations - Gauss Elimination method, Gauss-Jordan methods, Iterative methods Jacobi and Gauss-Seidel. Matrix Inversion by Gauss-Jordan method – Eigen values of a matrix by Power method and by Jacobi's method.

UNIT-II INTERPOLATION AND APPROXIMATION

Interpolation with equal intervals - Newton's forward and backward difference formulae. Central difference formula: Stirling formula. Interpolation with unequal intervals - Lagrange interpolation, Newton's divided difference interpolation.

UNIT-III NUMERICAL DIFFERENTIATION AND INTEGRATION

Approximation of derivatives using interpolation (Forward, Backward & Central difference formula) . Numerical integration using Trapezoidal, Simpson's 1/3 and Simpson's 3/8 rules – Romberg's method -Two point and three point Gaussian quadrature formulae – Evaluation of double integrals by Trapezoidal and Simpson's rules.

UNIT-IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS

Picard's methods, Taylor's series method, Euler's method, Modified Euler's method, Fourth order Runge -Kutta method for solving ordinary differential equations. Predictor-corrector methods- Milne's and Adams- Bashforth for solving ordinary differential equations.

UNIT-V BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS

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.

OUTCOMES:

The students 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.

TEXT BOOKS

1. Grewal, B.S. and Grewal, J.S., "Numerical methods in Engineering and Science", 6th Edition, Khanna Publishers, New Delhi, 2004.
2. Sankara Rao, K. "Numerical methods for Scientists and Engineers", 3rd Edition Prentice Hall of India Private Ltd., New Delhi, 2007.

REFERENCES

1. Chapra, S. C and Canale, R. P. "Numerical Methods for Engineers", 5th Edition, Tata Mc Graw-Hill, New Delhi, 2007.
2. Gerald, C. F. and Wheatley, P. O., "Applied Numerical Analysis", 6th Edition, Pearson Education Asia, New Delhi, 2006.
3. Brian Bradie, "A friendly introduction to Numerical analysis", Pearson Education Asia, New Delhi, 2007.

**MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.**

Semester: IV B.Tech

Subject: Mechanics of Machines

Total Theory Periods: 48

Total Tutorial Periods: 12

Branch: Aeronautical

Code: BT 451

Total Credits: 04

OBJECTIVES:

- To understand the principles in the formation of mechanisms and their kinematics.
- To understand the effect of friction in different machine elements.
- To analyse the forces and toques acting on simple mechanical systems
- To understand the importance of balancing and vibration.

UNIT I MECHANISMS

Definition – Machine and Structure – Kinematic link, pair and chain – classification of Kinematic pairs – Constraint & motion – Degrees of freedom slider crank – Single and double – Crank rocker mechanisms – Inversions – applications, Kinematic analysis and synthesis of simple mechanisms – Determination of velocity and acceleration of simple mechanisms.

UNIT II FRICTION

Types of friction – friction in screw and nut – pivot and collar – thrust bearings – collar bearing – plate and disc clutches – belt (flat & vee) and rope drives – creep in belts –Jockey pulley – open and crossed belt drives – Ratio of tensions – Effect of centrifugal and initial tensions – Effect of centrifugal and initial tension – condition for maximum power transmission.

UNIT III GEARING AND CAMS

Gear profile and geometry – nomenclature of spur & helical gears – laws of gearing – interference – requirement of minimum number of teeth in gears – gear trains –simple and compound gear trains – determination of speed and torque in epicyclic gear trains – cams different types of followers – cam design for different follower motions.

UNIT IV BALANCING

Static and dynamic balancing – single and several masses in different planes –primary and secondary balancing of reciprocating masses – balancing single and multi-cylinder Engines – Governors and Gyroscopic effects.

UNIT V VIBRATION

Free, forced and damped vibrations of single degree of freedom systems – force transmitted to supports – vibration Isolation – vibration absorption – Torsional vibration of shafts – single and multirotor systems – geared shafts – critical speed of shafts.

OUTCOMES:

- Upon completion of this course, the students can able to apply mathematical knowledge to predict the properties and characteristics of a fluid.
- Can critically analyse the performance of pumps and turbines.

TEXT BOOKS

1. Bansal Dr. R. K. “Theory of Machines” Laxmi Publications (P) Ltd., New Delhi, 2001.
2. Rattan S. S. “Theory of machines” Tata McGraw Hill publishing Co., New Delhi, 2002.

REFERENCES:

1. Rao J. S. and Dukupati R.V. "Mechanism and Machine Theory" Second Edition, Wiley Eastern Limited, 1992.
2. Malhotra D.R. and Gupta H.C "The Theory of machines" Satya Prakasam, Tech. India Publications, 1989.
3. Gosh A and Mallick A.K. "Theory of Machines and Mechanisms" affiliated eastwest press, 1989.
4. Shingley J.E. and Vicker J.J. Theory of Machines and Mechanisms" McGraw Hill, 1986.
5. Burton Paul "Kinematics and Dynamics of Machinery", Prentice Hall, 1979.

**MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.**

Semester: IV B.Tech

Subject: Aerodynamics-I

Total Theory Periods: 48

Total Tutorial Periods: 12

Branch: Aeronautical

Code: BT 452

Total Credits: 04

OBJECTIVES:

- To introduce the concepts of mass, momentum and energy conservation relating to aerodynamics.
- To make the student understand the concept of vorticity, irrotationality, theory of airfoils and wing sections.
- To introduce the basics of viscous flow.

UNIT I REVIEW OF BASIC FLUID MECHANICS

System and Control volume approach, substantial, local and convective derivative, Continuity, momentum and energy equations, inviscid flow, Euler equation, incompressible Bernoulli's Equation. Circulation and Vorticity, Green's Lemma and Stoke's Theorem, Barotropic Flow, Kelvin's theorem, Streamline, Stream Function, Irrotational flow, Potential Function, Equi Potential Lines, Elementary Flows and their combinations.

UNIT II TWO DIMENSIONAL INVISCID INCOMPRESSIBLE FLOW

Ideal Flow over a circular cylinder, D'Alembert's Paradox, Magnus effect, Kutta Joukowski's Theorem, Starting Vortex, Kutta condition, Real flow over smooth and rough cylinder.

UNIT III AIRFOIL THEORY

Cauchy-Riemann relations, Complex Potential, Methodology of Conformal Transformation, Kutta-Joukowski transformation and its applications, Karman Trefftz Profiles, Thin Airfoil theory and its applications.

UNIT IV SUBSONIC WING THEORY

Vortex Filament, Biot and Savart Law, Bound Vortex and trailing Vortex, Horse Shoe Vortex, Lifting Line Theory and its limitations.

UNIT V INTRODUCTION TO LAMINAR AND TURBULENT FLOW

Boundary layer and boundary layer thickness, displacement thickness, momentum thickness, Energy thickness, Shape parameter, Boundary layer equations for a steady, two dimensional incompressible flow, Boundary Layer growth over a Flatplate, Critical Reynolds Number, Clausius solution, Basics of Turbulent flow, Prandtl's mixing length hypothesis, Free shear layers.

OUTCOMES:

- An ability to apply airfoil theory to predict air foil perform
- A knowledge of incompressible flow
- An explosive to Boundary layer theory

TEXT BOOKS

1. Houghton, E.L., and Caruthers, N.B., Aerodynamics for Engineering students, Edward Arnold Publishers Ltd., London, 1989.
2. Anderson, J.D., Fundamentals of Aerodynamics, McGraw Hill Book Co., 1999.

REFERENCES

1. Milne Thomson, L.H., Theoretical Aerodynamics, Macmillan, 1985.
2. John J Bertin., Aerodynamics for Engineers, Pearson Education Inc, 2002.
3. Clancey, L J., Aerodynamics, Pitman, 1986.

**MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.**

Semester: IV B.Tech

Branch: Aeronautical

Subject: Aircraft System and Instrumentation

Code: BT 453

Total Theory Periods: 60 Total Tutorial Periods: 00

Total Credits: 04

OBJECTIVES:

- To impart knowledge of the hydraulic and pneumatic systems components and types of instruments and its operation including navigational instruments to the students

UNIT I AIRCRAFT SYSTEMS

Hydraulic systems – Study of typical workable systems – components – Hydraulic systems controllers – Modes of operation – Pneumatic systems – Working principles– Typical Pneumatic Power system – Brake system – Components, Landing Gear Systems – Classification – Shock absorbers – Retractive mechanism.

UNIT II AIRPLANE CONTROL SYSTEMS

Conventional Systems – Power assisted and fully powered flight controls – Power actuated systems – Engine control systems – Push pull rod system – operating principles – Modern control systems – Digital fly by wire systems – Auto pilot system, Active Control Technology.

UNIT III ENGINE SYSTEMS

Fuel systems – Piston and Jet Engines – Components - Multi-engine fuel systems, lubricating systems - Piston and jet engines – Starting and Ignition systems – Piston and Jet engines.

UNIT IV AIRCONDITIONING AND PRESSURIZING SYSTEM

Basic Air Cycle systems – Vapour Cycle Systems, Boot-strap air cycle system –Evaporative vapour cycle systems – Evaporation air cycle systems –Oxygen systems – Fire protection systems, De-icing and anti-icing system.

UNIT V AIRCRAFT INSTRUMENTS

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

OUTCOMES:

- Know the operation of airplane control system, Engine system, Air conditioning and pressing system.
- Know the operation of air data Instruments system

TEXT BOOKS

1. Mekinley, J.L. and R.D. Bent, Aircraft Power Plants, McGraw Hill 1993.
2. Pallet, E.H.J. Aircraft Instruments & Principles, Pitman & Co 1993.

REFERENCES

1. Teager, S. Gas Turbine technology, McGraw Hill 1997.
2. Mckinley, J.L. and Bent R.D. Aircraft Maintenance & Repair, McGraw Hill, 1993.
3. Handbooks of Airframe and Powerplant Mechanics, US Dept. of Transportation, Federal, Aviation Administration, The English Book Store, New Delhi, 1995.

**MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.**

Semester: IV B.Tech

Branch: Aeronautical

Subject: Aircraft Structures-I

Code: BT 454

Total Theory Periods: 48 Total Tutorial Periods: 12

Total Credits: 04

OBJECTIVES:

- To provide the students an understanding on the linear static analysis of determinate and indeterminate aircraft structural components.
- To provide the design process using different failure theories.

UNIT I STATICALLY DETERMINATE STRUCTURES

Statically determinate frames – plane truss analysis – method of joints – method of sections – 3-D trusses – the landing gear tripod – beams of two materials.

UNIT II STATICALLY INDETERMINATE STRUCTURES

Propped cantilevers – fixed-fixed beams– Clapeyron's 3 moment equation –moment distribution method.

UNIT III ENERGY METHODS

Strain energy evaluation in structural members – energy theorems – dummy load & unit load methods – Maxwell's reciprocal theorem – energy methods applied to statically determinate and indeterminate beams, frames, rings & trusses.

UNIT IV COLUMNS

Euler's column curve – inelastic buckling – effect of initial curvature – the Southwell plot – columns with eccentricity – use of energy methods – theory of beam columns –beam columns with different end conditions – stresses in beam columns.

UNIT V FAILURE THEORIES

Ductile and brittle materials – maximum principal stress theory - maximum principal strain theory - maximum shear stress theory - distortion energy theory – octahedral shear stress theory.

OUTCOMES:

- Students will get an understanding on the linear static analysis of determinate and indeterminate aircraft structural components.
- Students will understand the design process using different failure theories.

TEXT BOOKS

1. Timoshenko and Gere, 'Mechanics of Materials', Tata McGraw Hill, 1993.
2. Bruhn E F, 'Analysis and Design of Flight Vehicle Structures', Tri-State Off-set Company, USA, 1985

REFERENCES

1. Donaldson, B.K., 'Analysis of Aircraft Structures - An Introduction', McGraw Hill, 1993.
2. Megson T M G, 'Aircraft Structures for engineering students' Edward ArnoldPublishers.
3. Peery, D.J., and Azar, J.J., Aircraft Structures, 2nd edition, McGraw – Hill, N.Y., 1999.

**MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.**

Semester: IV B.Tech
Subject: Aircraft Instruments Lab
Total Practical Periods: 28

Branch: Aeronautical
Code: BT 456
Total Credits: 01

OBJECTIVES:

To provide the students practical understanding of various aircraft flight instruments.

LIST OF EXPERIMENTS

1. Familiarization of computer, accessories.
2. Autopilots (electrical or electronics) dismantling, examination of components, reassembly, and installation in A/C or on simulator by following the manufacturer's test programme: practice with portable test kit.
3. Examination and testing of element of flight director systems, automatic flare, automatic landing systems.
4. Safety precaution associated with radio equipment hazards: high voltage, RF emission and microwave emissions, Electrostatic discharge etc.
5. Wiring and cabling demonstration and practice in wiring and soldering radio circuits.
6. Multimeter, Megger and bonding testers: demonstration and practice.
7. Identification and inspection of antenna: external wire aerials, blade, rod and rail aerials:
8. D/F loops and suppressed aerials viewing on A/C and inspection for physical condition. Aerial masts, static dischargers etc. inspection and servicing.
9. To demonstrate the measurements and experiments with circuit demonstration units simulating the following system elements
TRF receiver, Intermediate frequency amplifier, Frequency convertor, Super heterodyne alignment, Buffer-doubler amplifier, RF amplifier, Modulation and demodulation, Transmission lines, Reactance tube modulators, Interference (filtering and shielding).
10. Troubleshooting Practices.

LIST OF EQUIPMENTS

(For a batch of 30 students)

S. No.	Details of Equipments	Qty Req.	Expt. No.
1	Computer (Min 1 GB RAM)	30	1, 2, 3, 8
2	Autopilot Test Kit with Simulator	1 set	2
3	Soldering Kit	30 sets	4, 5
4	Multimeter, Megger and Bonding Tester	30	6
5	Antenna	1	7
6	TRF receiver	1	9
7	Intermediate frequency amplifier	1	9
8	Frequency convertor	1	9
9	Buffer-doubler amplifier	1	9
10	RF amplifier	1	9
11	Reactance tube modulators	1	9

OUTCOMES:

Students will get practical understanding of various aircraft flight instruments.

**MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.**

Semester: IV B.Tech
Subject: Aerodynamics Lab
Total Practical Periods: 28

Branch: Aeronautical
Code: BT 457
Total Credits: 01

OBJECTIVES:

To make students aware about flow visualization in water channel and wind tunnel and provide them the practical knowledge of wind tunnel testing.

LIST OF EXPERIMENTS

1. Generation of lift and tip vortices.
2. Flow visualization in water flow channel
3. Flow visualization in smoke tunnel
4. Plot of RPM Vs test section velocity in a subsonic wind tunnel.
5. Pressure distribution over circular cylinder.
6. Pressure distribution over airfoil and estimation of C_L and C_D .
7. Force measurement using wind tunnel balance.
8. Mach number distribution in nozzle of supersonic wind tunnel.
9. Use of Schlieren system to visualize shock.
10. Use of Shadow graph system to visualize shock.

LIST OF EQUIPMENTS

(For a batch of 30 students)

S. No.	Details of Equipments	Qty Req.	Expt. No.
1	Blower, Balance, and small aspect ratio model	1	1
2	Water flow channel & models	1 set	2
3	Subsonic wind tunnel	1	3, 4,5,6,7
4	Smoke apparatus and rake	1	3
5	Manometer, Pitot-Static tube	1	4,5,6
6	Circular cylinder and Aerofoil pressure distribution models	1	5,6
7	Wind tunnel strain gauge balance	1	7
8	Supersonic wind tunnel, Mercury manometer	1	8,9,10
9	Schlieren system and Shadow graph system	1	9,10
10	Sharp nosed and Blunt nosed models	1	9,10

OUTCOMES:

Students will become aware about flow visualization in water channel and wind tunnel and will get the practical knowledge of wind tunnel testing.

**MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.**

Semester: IV B.Tech
Subject: Mechanics of Machines Lab
Total Practical Periods: 28

Branch: Aeronautical
Code: BT 458
Total Credits: 01

OBJECTIVES:

To give students practical approach of handling various governors, clutch plates, wheel gears and belts and pulleys.

LIST OF EXPERIMENTS

1. To observe the lift-off speed of a Porter Governor.
2. To observe the effect of varying sleeve weight or spring force on the operation of a Porter Governor.
3. To observe the lift-off speed of a Proell Governor.
4. To observe the effect of varying sleeve weight or spring force on the operation of a Proell Governor.
5. To observe the lift-off speed of a Hartnell Governor.
6. To observe the effect of varying sleeve weight or spring force on the operation of a Hartnell Governor.
7. To investigate the behavior of Flat Clutch plates and to compare the results using two different methods (uniform pressure and uniform wear) of calculations.
8. To investigate the behavior of a Worm wheel gear set.
9. To measure the coefficient of static and kinetic friction between wooden blocks.
10. To study the tension in the tight and in slack side of a square thread and a vee thread.
11. To determine the coefficient of friction for a square belt and vee belt and compare the results which is in contact with a cast iron pulley.
12. To investigate different types of epicyclic gear configurations and check ratios with theoretical values.
13. To investigate the masses which required to balance the rod in the rotating and reciprocating positions.

LIST OF EQUIPMENTS

(For a batch of 30 students) S. No.	Details of Equipments	Qty Req.	Expt. No.
1	Varying Sleeve Weight	2 each	2, 4, 6
2	Porter Governor Setup	1	1, 2
3	Proell Governor Setup	1	3, 4
4	Hartnell Governor Setup	1	5, 6
5	Flat Clutch Plates	2	7
6	Worm Wheel Gear Setup	1	8
7	Wooden Blocks	2	9
8	Static and Kinetic Friction Test Setup	1	9
9	Square Thread and Vee Thread Test Setup	1	10
10	Cast Iron Pulley	1	11
11	Square Belt and Vee Belt Friction Test Setup	1	11
12	Epicyclic Gear Arrangements	1	12
13	Rod Balancing Test Setup	1	13

OBJECTIVES:

Students will get practical approach of handling various governors, clutch plates, wheel gears and belts and pulleys.

**MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.**

Semester: IV B.Tech
Subject: Design and Drafting Lab
Total Practical Periods: 28

Branch: Aeronautical
Code: BT 459
Total Credits: 01

OBJECTIVES:

To introduce the concept of design of basic structural components and to draft both manually and using modelling package.

LIST OF EXPERIMENTS

1. Design and Drafting of riveted joints.
2. Design and Drafting of welded joints.
3. Design and Drafting Control Components Cam.
4. Design and Drafting Control Components Bell Crank.
5. Design and Drafting Control Components Gear.
6. Design and Drafting Control Components Push-pull rod.
7. Three view diagram of a typical aircraft.
8. Layout of typical wing structure.
9. Layout of typical fuselage structure.
10. Layout of Control System.

LIST OF EQUIPMENTS

(For a batch of 30 students)

S. No.	Details of Equipments	Qty Req.	Expt. No.
1	Drawing Boards, Drafting machines	30	1 to 10

OUTCOMES

Ability to design and draw different joints and components using manual drafting method.

**MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.**

Semester: IV B.Tech

Subject: Control System Engineering

Total Theory Periods: 48 Total Tutorial Periods: 00

Branch: Aeronautical

Code: BT 4551

Total Credits: 03

OBJECTIVES:

- To introduce the mathematical modeling of systems, open loop and closed loop systems and analyses in time domain and frequency domain.
- To impart the knowledge on the concept of stability and various methods to analyze stability in both time and frequency domain.
- To introduce sampled data control system.

UNIT-I INTRODUCTION

Historical review, Simple pneumatic, hydraulic and thermal systems, Series and parallel system, Analogies, mechanical and electrical components, Development of light control systems.

UNIT-II OPEN AND CLOSED LOOP SYSTEMS

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

UNIT-III CHARACTERISTIC EQUATION AND FUNCTIONS

Laplace transformation, Response of systems to different inputs viz., Step impulse, pulse, parabolic and sinusoidal inputs, Time response of first and second order systems, steady state errors and error constants of unity feedback circuit.

UNIT-IV CONCEPT OF STABILITY

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

UNIT-V SAMPLED DATA SYSTEMS

Z-Transforms, Introduction to digital control system, Digital Controllers and Digital PID controllers

OUTCOMES:

- Ability to apply mathematical knowledge to model the systems and analyse the frequency domain
- Ability to check the stability of the both time and frequency domain

TEXT BOOKS:

1. OGATO, Modern Control Engineering, Prentice-Hall of India Pvt. Ltd., New Delhi, 1998.
2. Azzo, J.J.D. and C.H. Houpis, Feedback control system analysis and synthesis, McGraw-Hill international 3rd Edition, 1998.

REFERENCES:

1. Kuo, B.C. Automatic control systems, Prentice-Hall of India Pvt.Ltd., New Delhi,1998.
2. Houpis, C.H. and Lamont, G.B. Digital control Systems, McGraw Hill Book co.,New York, U.S.A. 1995.
3. Naresh K Sinha, Control Systems, New Age International Publishers, New Delhi, 98.

**MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.**

Semester: IV B.Tech

Branch: Aeronautical

Subject: Microprocessor and Applications

Code: BT 4552

Total Theory Periods: 48 Total Tutorial Periods: 00

Total Credits: 03

OBJECTIVES:

To introduce functions, working and applications of various electronics components and microprocessors in aviation sector.

UNIT-I ELECTRONIC COMPONENTS AND DEVICES

Resistors, Capacitors, Inductors and Transformers - properties, types. Simple PN Junction Diodes, Zener diode, Bipolar Junction transistor and Field Effect Transistors – operating principles and characteristics. Other Devices – UJT, SCR, LED, Photo detectors.

UNIT-II ANALOG CIRCUITS

Rectifier and Power Supply Circuits, clipper, clamper using diodes, Operational Amplifiers (Ideal) – properties and typical circuits like differentiator, integrator, summer, comparator, single-stage BJT's and FET's amplifiers – Multistage Amplifier Principles (Qualitative Treatment only).

UNIT-III DIGITAL CIRCUITS

Basics of Boolean Logic – Logic Gates, Flip-Flops, Shift-Registers, Counters, Decoders/Drivers, Timer, Display Devices, A/D and D/A Converter.

UNIT-IV MEASUREMENTS AND INSTRUMENTS

Definitions of Accuracy, Precision, Sensitivity, Resolution, Linearity, Range, Measurement of Electrical Quantities – Voltmeter, Ammeter, Watt-Meter, DMM, CRO, DSO, Transducers and signal conditioning systems for pressure, temperature, acceleration measurements (Qualitative Treatment only).

UNIT V MICROPROCESSORS AND APPLICATIONS

Architecture of 8085 processors, Address Modes, Instruction set, simple programming like addition, subtraction, multiplication, logical operation, Peripherals and Interfacing – 8255, 8251. Applications like motor control, keyboard and PC interface, Introduction to Microcontrollers.

OBJECTIVES:

Students will get the knowledge about functions, working and applications of various electronics components and microprocessors in aviation sector.

TEXT BOOK

1. Millman, J. and Halkias, C., "Integrated Electronics", Tata McGraw Hill, 2004.
2. Paul Horowitz and Wilfred Hill "The Art of Electronics", Cambridge University press, 1989.

REFERENCES

1. Donald P Leach, Albert Paul Malvino and Goutam Saha," Digital Principles & Applications", 6E, Tata McGraw Hill, 2006.
2. A. K. Sawhney, A course in Electrical and Electronic Measurement and Instrumentation", Dhanpat Rai and Sons, New Delhi, 1999
3. Helfrick, A. D., & Cooper, W. D., "Electronic Instrumentation and Measurement techniques ", Prentice Hall of India, 1998.

4. Gaonkar. Ramesh S, "Microprocessor Architecture Programming & Applications with 8085 ", 5th Ed. Penram International Publishing (India), 2003.
5. Kenneth J.Ayala., "The 8051 Microcontroller Architecture Programming and Applications", 2ed, Penram International Publishing (India), 2004.

**MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.**

Semester: IV B.Tech

Branch: Aeronautical

Subject: Experimental Stress Analysis

Code: BT 4553

Total Theory Periods: 48 Total Tutorial Periods: 00

Total Credits: 03

OBJECTIVE:

To make the students learn basic principles of operation, electrical resistance strain gauges, photoelasticity and interferometric techniques and non destructive methods.

UNIT-I EXTENSOMETERS

Principles of measurements, Accuracy, Sensitivity and range of measurements, Mechanical, Optical, Acoustical and Electrical extensometers and their uses, Advantages and disadvantages.

UNIT-II ELECTRICAL RESISTANCE STRAIN GAUGES

Principle of operation and requirements, Types and their uses, Materials for strain gauge, Calibration and temperature compensation, cross sensitivity, Rosette analysis, Wheatstone bridge and potentiometer circuits for static and dynamic strain measurements, strain indicators.

UNIT-III PHOTOELASTICITY

Two dimensional photo elasticity, Photo elastic materials, Concept of light - photo elastic effects, stress optic law, Transmission and Reflection polariscopes, Interpretation of fringe pattern, Compensation and separation techniques, Introduction to three dimensional photo elasticity.

UNIT-IV BRITTLE COATING AND MOIRE METHODS

Introduction to Moiré techniques, Brittle coating methods and Holography

UNIT-V NON – DESTRUCTIVE TESTING

Fundamentals of NDT, Radiography, Ultrasonics, Eddy Current testing, Fluorescent Penetrant Testing, Acoustic Emission Technique,

OUTCOMES:

Upon completion of the course, students will be able to appreciate use of strain gauges and its principles, principle of photo elasticity and its use, NDT techniques.

TEXT BOOKS

1. Dally, J.W., and Riley, W.F., Experimental Stress Analysis, McGraw Hill Inc., New York 1998.
2. Srinath, L.S., Raghava, M.R., Lingaiah, K., Garagesha, G., Pant B., and Ramachandra, K., Experimental Stress Analysis, Tata McGraw Hill, New Delhi, 1984.

REFERENCES

1. Hetenyi, M., Hand book of Experimental Stress Analysis, John Wiley and Sons Inc., New York, 1972.
2. Pollock A.A., Acoustic Emission in Acoustics and Vibration Progress, Ed. Stephens R.W.B., Chapman and Hall, 1993.
3. Max Mark Frocht, Photo Elasticity, John Wiley and Sons Inc., New York, 1968
4. A.J.Durelli, Applied Stress Analysis, Prentice Hall of India Pvt Ltd., New Delhi, 1970.

**MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.**

Semester: IV B.Tech

Subject: Professional Ethics and Human Values

Total Theory Periods: 48

Total Tutorial Periods: 00

Branch: Aeronautical

Code: BT 4554

Total Credits: 03

OBJECTIVE:

To make the students learn basics of human values, professional ethics, safety, responsibilities, rights and global issues.

UNIT-I HUMAN VALUES

Morals, Values and Ethics – Integrity – Work Ethic – Service Learning – Civic Virtue – Respect for Others – Living Peacefully – caring – Sharing – Honesty – Courage –Valuing Time – Co-operation – Commitment – Empathy – Self-Confidence – Character –Spirituality.

UNIT-II ENGINEERING ETHICS

Senses of 'Engineering Ethics' - variety of moral issued - types of inquiry – moral dilemmas - moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy – Models of Professional Roles - theories about right action - Self-interest - customs and religion - uses of ethical theories.

UNIT-III ENGINEERING AS SOCIAL EXPERIMENTATION

Engineering as experimentation-engineers as responsible experimenters-codes of ethics-balanced outlook on law - the challenger case study.

UNIT-IV SAFETY, RESPONSIBILITIES AND RIGHTS

Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk -the Three Mile Island and Chernobyl case studies. Collegiality and loyalty - respect for authority-collective bargaining-confidentiality-conflicts of interest-occupational crime-professional rights - employee rights - Intellectual Property Rights (IPR) - discrimination.

UNIT-V GLOBAL ISSUES

Multinational corporations - Environmental ethics - computer ethics – weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors - moral leadership-sample code of Ethics like ASME, ASCE, IEEE, Institution of Engineers (India), Indian Institute of Materials Management, Institution of electronics and telecommunication engineers (IETE), India, etc.

OUTCOMES:

Students will learn basics of human values, professional ethics, safety, responsibilities, rights and global issues.

TEXT BOOKS

1. Mike Martin and Roland Schinzinger, “Ethics in Engineering”, McGraw-Hill, New York 1996.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, “Engineering Ethics”, Prentice Hall of India, New Delhi, 2004.

REFERENCES

1. Charles D. Fleddermann, “Engineering Ethics”, Pearson Education / Prentice Hall, New Jersey, 2004 (Indian Reprint now available).
2. Charles E Harris, Michael S. Protchard and Michael J Rabins, “Engineering Ethics – Concepts and Cases”, Wadsworth Thompson Learning, United States, 2000.

3. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003.
4. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, Oxford, 2001.

**MATS UNIVERSITY, RAIPUR (C.G.)
SCHOOL OF ENGINEERING & I.T.**

Semester: IV B.Tech

Branch: Aeronautical

Subject: Organizational Behaviour

Code: BT 4555

Total Theory Periods: 48 Total Tutorial Periods: 00

Total Credits: 03

OBJECTIVE:

To make the students aware about fundamentals of organizational behaviour and its role in engineers life.

UNIT-I FUNDAMENTALS OF OB

Definition, scope and importance of OB, Relationship between OB and the individual, Evolution of OB, Theoretical framework (cognitive), behavioristic and social cognitive), Limitations of OB.

UNIT-II ATTITUDE, PERSONALITY AND VALUES, PERCEPTION AND MOTIVATION

Attitude: Importance of attitude in an organization, Right Attitude, Components of attitude, Relationship between behavior and attitude, Developing Emotional intelligence at the workplace, Job attitude, Barriers to changing attitudes.

Personality and values: Definition and importance of Personality for performance, The Myers-Briggs Type Indicator and The Big Five personality model, Significant personality traits suitable to the workplace (personality and job-fit theory), Personality Tests and their practical applications.

Perception: Meaning and concept of perception, Factors influencing perception, Selective perception, Attribution theory, Perceptual process, Social perception (stereotyping and halo effect).

Motivation: Definition & Concept of Motive & Motivation, The Content Theories of Motivation (Maslow's Need Hierarchy & Herzberg's Two Factor model Theory), The Process Theories (Vroom's expectancy Theory & Porter Lawler model), Contemporary Theories – Equity Theory of Work Motivation.

UNIT-III FOUNDATIONS OF GROUP BEHAVIOR, MANAGING TEAMS AND LEADERSHIP

Foundations of Group Behavior: The Meaning of Group & Group behavior & Group Dynamics, Types of Groups, The Five – Stage Model of Group Development.

Managing Teams: Why Work Teams, Work Teams in Organization, Developing Work Teams, Team Effectiveness & Team Building.

Leadership: Concept of Leadership, Styles of Leadership, Trait Approach Contingency Leadership Approach, Contemporary leadership, Meaning and significance of contemporary leadership, Concept of transformations leadership, Contemporary theories of leadership, Success stories of today's Global and Indian leaders.

UNIT-IV ORGANIZATIONAL CULTURE AND ORGANIZATIONAL CHANGE

Organizational Culture : Meaning & Definition of Organizational Culture, creating & Sustaining Organizational Culture, Types of Culture (Strong vs. Weak Culture, Soft Vs. Hard Culture & Formal vs. Informal Culture), Creating Positive Organizational Culture, Concept of Workplace Spirituality.

Organizational Change: Meaning, Definition & Nature of Organizational Change, Types of Organizational Change, Forces that acts as stimulants to change.

UNIT-V IMPLEMENTING ORGANIZATIONAL CHANGE

Implementing Organizational Change: How to overcome the Resistance to Change, Approaches to managing Organizational Change, Kurt Lewin's-Three step model, Seven Stage model of Change & Kotter's Eight-Step plan for Implementing Change, Leading the Change Process, Facilitating Change, Dealing with Individual & Group Resistance, Intervention Strategies for Facilitating Organizational Change, Methods of Implementing Organizational Change, Developing a Learning Organization.

OBJECTIVE:

Students will become aware about fundamentals of organizational behaviour and its role in engineers life.

TEXT BOOKS:

1. Stephen P. Robbins, David & Decenzo, "Fundamentals of Management", 3rd Edition, Pearson Education, 2002.
2. J. S. Chandan, "Organisational Behaviour", Vikas Publishing House, 2004.
3. John M. Ivancevich, T. N. Duening, "Business & Management: Principles and Guidelines", biztantra, Dreamtech, 2005.

REFERENCES BOOKS:

1. Joseph W. Weiss, "Organisational Behaviour & Change, Managing Diversity, Cross-Cultural Dynamics & Ethics", 2nd Edition, Vikas Publishing House, 2003.
2. Richard Pettinger, "Introduction to Management", 3rd Edition, Palgrave Macmillan, 2002.
3. Udai Pareek, "Understanding Organisational Behaviour", 1st Edition, Oxford University Press, 2004.
4. Fred Luthans, "Organisational Behaviour," 9th Edition, McGraw Hill International Edition, 2004.