SEMESTER-VIII

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

Semester: VIII B.Tech — Branch: Aeronautical
Subject: Rockets and Missiles — Code: BT 850
Total Theory Periods: 48 Total Tutorial Periods: 00 — Total Credits: 04

OBJECTIVES:
To make students aware about rocket systems, aerodynamics of rockets and missiles, rocket motion in space and gravity, multi staging and control and materials used in rockets and missiles.

UNIT-I ROCKETS SYSTEM
Ignition System in rockets– types of Igniters–Igniter Design Considerations–Design Consideration of liquid Rocket Combustion Chamber, Injector Propellant Feed Lines, Valves, Propellant Tanks Outlet and Helium Pressurized and Turbine feed Systems–Propellant Slash and Propellant Hammer–Elimination of Geysering Effect in Missiles–Combustion System of Solid Rockets.

UNIT-II AERODYNAMICS OF ROCKETS AND MISSILES
Airframe Components of Rockets and Missiles – Forces Acting on a Missile While Passing Through Atmosphere – Classification of Missiles – methods of Describing Aerodynamic Forces and Moments – Lateral Aerodynamic Moment – Lateral Damping Moment and Longitudinal Moment of a Rocket – lift and Drag Forces – Drag Estimation – Body Upwash and Downwash in Missiles – Rocket Dispersion – Numerical Problems.

UNIT-III ROCKET MOTION IN FREE 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 OF ROCKETS AND MISSILES
Rocket Vector Control – Methods – Thrust determination – SITVC – Multistaging of rockets – Vehicle Optimization – Stage Separation Dynamics – Separation Techniques.

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

OUTCOMES:
Students will become aware about rocket systems, aerodynamics of rockets and missiles, rocket motion in space and gravity, multi staging and control and materials used in rockets and missiles.

TEXT BOOKS

1. Sutton G. P, “Rocket Propulsion Elements”, John Wiley & Sons Inc., New York, 1993.
2. Cornelisse, J.W., “Rocket Propulsion and Space Dynamics”, J.W., Freeman & Co. Ltd., London, 1982.

REFERENCES

1. Mathur, M., and Sharma, R.P., “Gas Turbines and Jet and Rocket Propulsion”, Standard Publishers, New Delhi 1998.
2. Parker, E. R., “Materials for Missiles and Spacecraft”, McGraw-Hill Book Co. Inc., 1982.
3. M. J. Zucrow, “Missile Propulsion”, John Wiley & sons.
4. H. S. Mukunda, “Understanding Aerospace Chemical Propulsion”, Interline Publishing Company Bangalore.

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

Semester: VIII B.Tech | Branch: Aeronautical
Subject: Computational Fluid Dynamics Lab | Code: BT 853
Total Theory Periods: 28 | Total Credits: 01

OBJECTIVES:
To introduce to the students various numerical solution methods pertaining to grid generation, time dependant and panel methods and also techniques pertaining to transonic small perturbation force

LIST OF EXPERIMENTS

1. To carry out flow simulation for the supersonic flow over a flat plate.
2. To carry out flow simulation for turbulent flow in a pipe.
3. Flow Simulation over a circular cylinder with circulation effect.
4. Generation velocity profile for laminar flow
5. Generation of velocity profile for turbulent flow
6. Nussent number determination for a flow with constant it edition
7. Nussent number determination for a flow with heat edition at constant temperature
8. Simulation of flow over a car body.
9. Simulation of supersonic flow over an aircraft.
10. Determination of drag for a flow over a body
11. Analysis of 2-D transient heat flow over a plate
12. To study about different K-E models.
13. Friction factor for laminar flow
14. Friction factor for turbulent flow
15. Shear stress distribution for a flow in horizontal duct
16. To study about Navier-Stoke's Equation and various methods for its solution.
17. To study about various Grid-less techniques used in CFD.
18. To study about Moving Mesh and Auto-Mesh techniques.
19. To study about species transport and energy transport equation for combustion analysis.

LIST OF EQUIPMENTS

1. Computers with minimum 1 GB RAM, Pentium-IV Processor,
2. Ansys Fluent and Gambit packages,
3. ANSYS- 12 with Fluent and CFX,
4. UPS 10 KVa 3-Phase.

OUTCOMES:
Upon completion of the course, students will learn the flow of dynamic fluids by computational methods.

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

Semester: VIII B.Tech | Branch: Aeronautical
Subject: Major Project and Dissertation | Code: BT 854
Total Theory Periods: 28 | Total Credits: 01

OBJECTIVES:

- To develop the ability to solve a specific problem right from its identification and literature review till the successful solution of the same.
- To train the students in preparing project reports and to face reviews and viva voce examination.

SUMMARY/PROCEDURE OF MAJOR PROJECT AND DISSERTATION

1. The objective of the project work is to enable the students to work in a group of likeminded colleagues on a project involving theoretical and experimental studies related to the branch of study.
2. Students will also be permitted to undertake industrial/consultancy project Work, outside the department, in industries/Research labs.
3. Students can opt for the co-guide from industries/ other colleges to get the necessary supervision.
4. There shall be four assessments during the semester by a review committee.
5. The student shall make four presentations on the progress made before the committee at various stages of the Project work.
6. The Head of the Department shall constitute the review committee for each branch of study.
7. The total marks obtained in the four reviews, shall be taken in to account.
8. There will be a viva-voce examination at the end of the Project work, conducted by one internal examiner and one external examiner.
9. The total marks secured will be the sum of marks secured in the Project reviews and Viva Voce Examination.
10. Every project work shall have a guide who is the member of the faculty of the institution.
11. Eighteen periods per week shall be allotted in the time table and this time shall be utilized by the students to receive the directions from the guide, on library reading, laboratory work, computer analysis or field work as assigned by the guide and also to present in periodical seminars on the progress made in the project.
12. Each student/group shall finally produce a comprehensive report in the form of Thesis covering background information, literature survey, problem statement, project work details and conclusion.
13. This final report shall be typewritten form as specified in the guidelines.
14. It is mandatory that the project selected should be research/industry oriented and at least two papers/articles related to the project work should be published/ accepted for publication in the national/international journals for dissertation.
15. The continuous assessment shall be made as prescribed by the regulation.

OUTCOMES:

On Completion of the project work students will be in a position to take up any challenging practical problems and find solution by formulating proper methodology.

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

Semester: VIII B.Tech — Branch: Aeronautical
Subject: Air Transportation and Aircraft Maintenance — Code: BT 8511
Total Theory Periods: 48 Total Tutorial Periods: 00 — Total Credits: 04

OBJECTIVES:
To develop the ability to understand air transportation and aircraft maintenance.

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 organization – levels of management, functions of management, Principles of organization planning the organization –chart, staff departments & line departments

UNIT-II AIRLINE ECONOMICS
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.
FLEET PLANNING: The aircraft selection process – Fleet commonality, factors affecting choice of fleet, route selection and Capitol acquisition – Valuation & Depreciation – Budgeting, Cost planning – Aircrew evaluation – Route analysis – Aircraft evaluation.

UNIT-III PRINCIPLES OF 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
Airlines scheduling (with reference to engineering) – Product support and spares – Maintenance sharing – Equipments and tools for aircraft maintenance – Aircraft weight control – Budgetary control. On board maintenance systems – Engine monitoring – Turbine engine oil maintenance –Turbine engine vibration monitoring in aircraft – Life usage monitoring – Current capabilities of NDT – Helicopter maintenance – Future of aircraft maintenance.

OUTCOMES:
Students will be able to understand air transportation and aircraft maintenance.

TEXT BOOKS

1. Fedric J.H., "Airport Management", 2000.
2. C.H. Friend, "Aircraft Maintenance Management", 2000.

REFERENCES

1. Gene Kropf, Airline Procedures.
2. Wilson & Bryon, Air Transportation.
3. Philip Locklin D, Economics of Transportation.
4. "Indian Aircraft manual" – DGCA Pub.
5. Alexander T Wells, Air Transportation, Wadsworth Publishing Company, California, 1993.

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

Semester: VIII B.Tech | Branch: Aeronautical
Subject: Industrial Aerodynamics | Code: BT 8512
Total Theory Periods: 48 Total Tutorial Periods: 00 | Total Credits: 04

OBJECTIVES:
To make students aware about use of aerodynamics concepts in industrial applications.

UNIT-I ATMOSPHERE
Types of winds, Causes of variation of winds, Atmospheric boundary layer, Effect of terrain on gradient height, Structure of turbulent flows.

UNIT-II WIND ENERGY COLLECTORS
Horizontal axis and vertical axis machines, Power coefficient, Betz coefficient by momentum theory.

UNIT-III VEHICLE AERODYNAMICS
Power requirements and drag coefficients of automobiles, Effects of cut back angle, Aerodynamics of trains and Hovercraft.

UNIT-IV BUILDING AERODYNAMICS
Pressure distribution on low rise buildings, wind forces on buildings. Environmental winds in city blocks, Special problems of tall buildings, Building codes, Building ventilation and architectural aerodynamics.

UNIT-V FLOW INDUCED VIBRATIONS
Effects of Reynolds number on wake formation of bluff shapes, Vortex induced vibrations, galloping and stall flutter.

OUTCOMES:
Students will become aware about use of aerodynamics concepts in industrial applications.

TEXT BOOKS

1. M.Sovran (Ed), “Aerodynamics and drag mechanisms of bluff bodies and road vehicles”, Plenum press, New York, 1978.
2. P. Sachs, “Winds forces in engineering”, Pergamon Press, 1978.

REFERENCES

1. R.D. Blevins, “Flow induced vibrations”, Van Nostrand, 1990.
2. N.G. Calvent, “Wind Power Principles”, Charles Griffin & Co., London, 1979.

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

Semester: VIII B.Tech | Branch: Aeronautical
Subject: Airframe Maintenance and Repair | Code: BT 8513
Total Theory Periods: 48 Total Tutorial Periods: 00 | Total Credits: 04

OBJECTIVES:

To make students aware about use of welding works in aircraft structures, sheet metal repair & maintenance, aircraft jacking, rigging and assembly, aircraft hydraulic and pneumatic systems and safety precautions.

UNIT-I WELDING IN AIRCRAFT STRUCTURAL COMPONENTS

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 – reverse technology.

UNIT-II PLASTICS AND COMPOSITES IN AIRCRAFT

Review of types of plastics used in airplanes – Maintenance and repair of plastic components – Repair of cracks, holes etc., various repair schemes – Scopes. Inspection and Repair of composite components – Special precautions – Autoclaves.

UNIT-III AIRCRAFT JACKING, ASSEMBLY AND RIGGING

Airplane jacking and weighing and C.G. Location. Balancing of control surfaces –Inspection maintenance. Helicopter flight controls. Tracking and balancing of main rotor.

UNIT-IV REVIEW OF HYDRAULIC AND PNEUMATIC SYSTEM

Trouble shooting and maintenance practices–Service and inspection–Inspection and maintenance of landing gear systems. – Inspection and maintenance of air-conditioning and pressurization system, water and waste system. Installation and maintenance of Instruments – handling– Testing – Inspection. Inspection and maintenance of auxiliary systems – Fire protection systems – Ice protection system – Rain removal system –Position and warning system – Auxiliary Power Units (APUs).

UNIT-V SAFETY PRACTICES

Hazardous materials storage and handling, Aircraft furnishing practices – Equipments. Trouble shooting - Theory and practices.

OUTCOMES:

Students will become aware about use of welding works in aircraft structures, sheet metal repair & maintenance, aircraft jacking, rigging and assembly, aircraft hydraulic and pneumatic systems and safety precautions.

TEXT BOOK

1. Kroes, Watkins, Delp, “Aircraft Maintenance and Repair”, McGraw-Hill, New York, 1992.

REFERENCES

1. Larry Reithmeir, “Aircraft Repair Manual”, Palamar Books, Marquette, 1992.
2. Brimm D.J. Bogges H.E., “Aircraft Maintenance”, Pitman Publishing corp. New York, 1940.

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

Semester: VIII B.Tech | Branch: Aeronautical
Subject: Fatigue and Fracture Mechanics | Code: BT 8514
Total Theory Periods: 48 Total Tutorial Periods: 00 | Total Credits: 04

OBJECTIVES:
To make students aware about fatigue and fracture mechanics.

UNIT-I FATIGUE OF STRUCTURES
S.N. curves - Endurance limits - Effect of mean stress, Goodman, Gerber and Soderberg relations and diagrams - Notches and stress concentrations - Neuber's stress concentration factors - Plastic stress concentration factors - Notched S.N. curves.

UNIT-II STATISTICAL ASPECTS OF 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 - Miner's theory - Other theories.

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 -Irwin - Orwin 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 ANDTESTINIG
Safe life and Fail-safe design philosophies - Importance of Fracture Mechanics in aerospace structures - Application to composite materials and structures.

OUTCOMES:
Students will become aware about fatigue and fracture mechanics.

TEXT BOOKS

1. Prasanth Kumar – "Elements of fracture mechanics" – Wheeter publication, 1999.
2. Barrois W, Ripely, E.L., "Fatigue of aircraft structure", Pegamon press. Oxford, 1983.
3. J. A. Bannantine, J. J. Comer, J. L. Handrock, Fundamentals of Metal Fatigue Analysis, Prentice Hall, 1990.

REFERENCES

1. Sin, C.G., "Mechanics of fracture" Vol. I, Sijthoff and w Noordhoff International Publishing Co., Netherlands, 1989.
2. Knott, J.F., "Fundamentals of Fracture Mechanics", Buterworth & Co., Ltd., London, 1983.

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

Semester: VIII B.Tech | Branch: Aeronautical
Subject: Helicopter Maintenance | Code: BT 8515
Total Theory Periods: 48 Total Tutorial Periods: 00 | Total Credits: 04

OBJECTIVES:
To make students aware about helicopter maintenance practices.

UNIT-I HELICOPTER FUNDAMENTAL
Basic directions – Ground handling, bearing – Gears.

UNIT-II MAIN ROTOR SYSTEM
Head maintenance – blade alignment – Static main rotor balance – Vibration – Tracking – Span wise dynamic balance – Blade sweeping–Electronic balancing–Dampener maintenance– Counter weight adjustment – Auto rotation adjustments – Mast & Flight Control Rotor -Mast – Stabilizer, dampeners – Swash plate flight control systems collective – Cyclic – Push pull tubes – Torque tubes –Bell cranks – Mixer box –Gradient unit control boosts – Maintenance & Inspection control rigging.

UNIT-III MAIN ROTOR TRANSMISSIONS
Engine transmission coupling – Drive shaft – Maintenance clutch – Freewheeling units – Spray clutch – Roller unit – Torque meter –Rotor brake–Maintenance of these components – vibrations – Mounting systems – Transmissions.

UNIT-IV POWER PLANTS & TAIL ROTORS
Fixed wing power plant modifications – Installation –Different type of power plant maintenance.
Tail rotor system – Servicing tail rotor track – System rigging.

UNIT-V AIRFRAMES AND RELATED SYSTEMS
Fuselage maintenance – Airframe Systems – Special purpose equipment.

OUTCOMES:
Students will become aware about helicopter maintenance practices

TEXT BOOKS:
1. Jeppesen, “Helicopter Maintenance”, Jeppesons and Sons Inc., 2000.

REFERENCES:
1. “Civil Aircraft Inspection Procedures”, Part I and II, CAA, English Book House, New Delhi, 1986.
2. Larry Reithmier, “Aircraft Repair Manual”, Palamar Books Marquette, 1992.

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

Semester: VIII B.Tech — Branch: Aeronautical
Subject: Theory of Plates and Shells — Code: BT 8521
Total Theory Periods: 36 Total Tutorial Periods: 00 — Total Credits: 03

OBJECTIVES:
To make students aware about theory of plates and shells.

UNIT-I CLASSICAL PLATE THEORY
Classical Plate Theory – Assumptions – Differential Equation – Boundary Conditions.

UNIT-II PLATES OF VARIOUS SHADES
Navier's Method of Solution for Simply Supported Rectangular Plates – Leavy's Method of Solution for Rectangular Plates under Different Boundary Conditions. Governing Equation – Solution for Axi-symmetric loading – Annular Plates – Plates of other shapes.

UNIT-III EIGEN VALUE ANALYSIS
Stability and free Vibration Analysis of Rectangular Plates.

UNIT-IV APPROXIMATE METHODS
Rayleigh–Ritz, Galerkin Methods– Finite Difference Method–Application to Rectangular Plates for Static, Free Vibration and Stability Analysis.

UNIT-V SHELLS
Basic Concepts of Shell Type of Structures – Membrane and Bending Theories for Circular Cylindrical Shells.

OUTCOMES:
Students will become aware about theory of plates and shells

TEXT BOOKS:
1. Timoshenko, S.P. Winowsky S., and Kreger, "Theory of Plates and Shells", McGraw-Hill Book Co. 1990.

REFERENCES:
1. Flugge, W. "Stresses in Shells", Springer – Verlag, 1985.
2. Timoshenko, S.P. and Gere, J.M., "Theory of Elastic Stability", McGraw-Hill Book Co. 1986.

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

Semester: VIII B.Tech — Branch: Aeronautical
Subject: High Temperature Materials — Code: BT 8522
Total Theory Periods: 36 Total Tutorial Periods: 00 — Total Credits: 03

OBJECTIVES:
To make students aware about high temperature materials and problems associated with use of materials in high temperature applications.

UNIT-I CREEP
Factors influencing functional life of components at elevated temperatures, definition of creep curve, various stages of creep, metallurgical factors influencing various stages, effect of stress, temperature and strain rate.

UNIT-II DESIGN FOR CREEP RESISTANCE
Design of transient creep time, hardening, strain hardening, expressions of rupture life of creep, ductile and brittle materials, Monkman-Grant relationship.

UNIT-III FRACTURE
Various types of fracture, brittle to ductile from low temperature to high temperature, cleavage fracture, ductile fracture due to micro void coalescence-diffusion controlled void growth; fracture maps for different alloys and oxides.

UNIT-IV OXIDATION AND HOT CORROSION
Oxidation, Pilling, Bedworth ratio, kinetic laws of oxidation- defect structure and control of oxidation by alloy additions, hot gas corrosion deposit, modified hot gas corrosion, fluxing mechanisms, effect of alloying elements on hot corrosion, interaction of hot corrosion and creep, methods of combat hot corrosion.

UNIT-V SUPERALLOYS AND OTHER MATERIALS
Iron base, Nickel base and Cobalt base super alloys, composition control, solid solution strengthening, precipitation hardening by gamma prime, grain boundary strengthening, TCP phase, embrittlement, solidification of single crystals, Inter metallics, high temperature ceramics.

OUTCOMES:
Students will become aware about high temperature materials and problems associated with use of materials in high temperature applications.

TEXT BOOKS:

1. Raj. R., “Flow and Fracture at Elevated Temperatures”, American Society for Metals, USA, 1985.
2. Hertzberg R. W., “Deformation and Fracture Mechanics of Engineering materials”, 4th Edition, John Wiley, USA, 1996.
3. Courtney T.H, “Mechanical Behavior of Materials”, McGraw-Hill, USA, 1990.

REFERENCES:

1. Boyle J.T, Spencer J, “Stress Analysis for Creep”, Butterworths, UK, 1983.
2. Bressers. J., “Creep and Fatigue in High Temperature Alloys”, Applied Science, 1981.
3. McLean D., “Directionally Solidified Materials for High Temperature Service”, The Metals Society, USA, 1985.

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

Semester: VIII B.Tech | Branch: Aeronautical
Subject: Entrepreneurship Development | Code: BT 8523
Total Theory Periods: 36 Total Tutorial Periods: 00 | Total Credits: 03

OBJECTIVES:
To make students aware about Entrepreneurship Development.

UNIT-I ENTREPRENEURSHIP
Entrepreneur – Types of Entrepreneurs – Difference between Entrepreneur and Intrapreneur – Entrepreneurship in Economic Growth, Factors Affecting Entrepreneurical Growth.

UNIT-II MOTIVATION
Major Motives Influencing an Entrepreneur – Achievement Motivation Training, self Rating, Business Game, Thematic Apperception Test – Stress management, Entrepreneurship Development Programs – Need, Objectives.

UNIT-III BUSINESS
Small Enterprises – Definition, Classification – Characteristics, Ownership Structures – Project Formulation – Steps involved in setting up a Business – identifying, selecting a Good Business opportunity, Market Survey and Research, Techno Economic Feasibility Assessment– Preparation of Preliminary Project Reports–Project Appraisal–Sources of Information– Classification of Needs and Agencies.

UNIT-IV FINANCING AND ACCOUNTING
Need – Sources of Finance, Term Loans, Capital Structure, Financial Institution, management of working Capital, Costing, Break Even Analysis, Network Analysis Techniques of PERT/CPM – Taxation – Income Tax, Excise Duty – Sales Tax.

UNIT-V SUPPORT TO ENTREPRENEURS
Sickness in small Business – Concept, Magnitude, causes and consequences, Corrective Measures – Government Policy for Small Scale Enterprises – Growth Strategies in small industry – Expansion, Diversification, Joint Venture, Merger and Sub Contracting.

OUTCOMES:
Students will become aware about Entrepreneurship Development.

TEXT BOOKS:

1. S.S.Khanka "Entrepreneurial Development" S. Chand & Co. Ltd. Ram Nagar New Delhi, 1999.
2. Hisrich R D and Peters M P, "Entrepreneurship" 5th Edition Tata McGraw-Hill, 2002.

REFERENCES:

1. Rabindra N. Kanungo "Entrepreneurship and innovation", Sage Publications, New Delhi, 1998.
2. EDII "Faulty and External Experts – A Hand Book for New Entrepreneurs Publishers: Entrepreneurship Development" Institute of India, Ahmadabad, 1986.

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

Semester: VIII B.Tech — Branch: Aeronautical
Subject: Theory of Elasticity — Code: BT 8524
Total Theory Periods: 36 Total Tutorial Periods: 00 — Total Credits: 03

OBJECTIVES:
To make the students understand aero elastic phenomena, flutter and to make them to solve steady state aero elastic problems.

UNIT-I BASIC EQUATIONS OF ELASTICITY
Stress – Strain – Stress Strain relationships - Equations of Equilibrium, Compatibility equations and strains, Boundary Conditions, Saint Venant's principle – Principal Stresses Stress Ellipsoid - Stress invariants.

UNIT-II PLANE STRESS AND PLANE STRAIN PROBLEMS
Airy's stress function, Bi harmonic equations, Polynomial solutions, Simple two dimensional problems in Cartesian coordinates like bending of cantilever and simply supported beams.

UNIT-III POLAR COORDINATES
Equations of equilibrium, Strain displacement relations, Stress – strain relations, Airy's stress function, Axi – symmetric problems, Kirsch, Michell's and Boussinesque problems – Rotating discs.

UNIT-IV TORSION
Navier's theory, St. Venant's theory, Prandtl's theory on torsion, the semi- inverse method and applications to shafts of circular, elliptical, equilateral triangular and rectangular sections.

UNIT-V THEORY OF PLATES
Classical plate theory – Assumptions – Governing equations – Boundary conditions – Navier's method of solution for simply supported rectangular plates – Levy's method of solution for rectangular plates under different boundary conditions.

OUTCOMES:
Upon completion of the course, Students can understand the theoretical concepts of material behaviour with particular emphasis on their elasticity property.

TEXT BOOKS

1. Timoshenko, S., and Goodier, T.N., Theory of Elasticity, McGraw – Hill Ltd., Tokyo, 1990.
2. Ansel C Ugural and Saul K Fenster, 'Advanced Strength and Applied Elasticity', 4th Edition, Prentice Hall, New Jersey, 2003.

REFERENCES

1. Wang, C.T., Applied Elasticity, McGraw – Hill Co., New York, 1993.
2. Sokolnikoff, I.S., Mathematical Theory of Elasticity, McGraw – Hill New York, 1978.
3. Enrico Volterra & J.H. Caines, Advanced Strength of Materials, Prentice Hall New Jersey, 1991.

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

Semester: VIII B.Tech | Branch: Aeronautical
Subject: Wind Engineering | Code: BT 8525
Total Theory Periods: 36 | Total Tutorial Periods: 00 | Total Credits: 03

OBJECTIVES:
To make the students understand wind engineering concepts, wind turbine, aerodynamics of wind turbine, blade element theory, power conversion and generation, economics and its impact on society and other aspects.

UNIT-I OVERVIEW OF WIND ENGINEERING
Introduction to Winds, Classification, Benefits of Wind Engineering, Assessment of Wind Resources, Assessment of means of energy production, consumption and cost, green credit.

UNIT-II WIND TURBINE
Wind Turbine terminology and definitions, types of wind turbines, HAWT, VAWT, Actuator disk model of HAWT and VAWT.

UNIT-III AERODYNAMICS OF WIND TURBINE
Lift, Drag and Pitching moment, Panel method for aerofoil analysis, modelling laminar and turbulent boundary layers and transitions, aerofoil design for wind energy applications.
BLADE ELEMENT THEORY: Inflow models based on combined blade element theory, incorporation of swirl losses in inflow, root and tip losses, and stall delay models, assessment of publically available wind turbine modelling tools, HAWT design using blade element theory.

UNIT-IV POWER CONVERSION AND GENERATION
Conversion of Mechanical energy into electricity, basic AC power generators, induced and synchronous generator, grid integration, tower, rotor, gear box, power regulation, safety mechanism, hybrid power systems and hybrid system modelling and simulation.

UNIT-V ECONOMICS AND IMPACT
Economic analysis of wind turbine system and wind energy, factors influencing the cost of energy generation, site specific and machine parameters, life cycle cost analysis, environmental benifits and problems of wind energy, impact of wind turbines on the environment, Application of wind energy.

OUTCOMES:
Students will be able to understand wind engineering concepts, wind turbine, aerodynamics of wind turbine, blade element theory, power conversion and generation, economics and its impact on society and other aspects

TEXT BOOKS:

1. Henry, Liu, Wind Engineering- A Handbook for structural Engineers, Pearson Education, 1990.
2. Tamura, Yukio, Kareem, Ahsan, Advanced Structural Wind Engineering, Springer, 2013.

REFERENCES:

1. A. R. Jha, Wind Turbine Technology, CRC Press, Taylor Francis, 2011.
2. P. Jain, Wind Energy Engineering.