(3rd SEMESTER)

Course		Contact Hrs.			Marks			Credits
Code	**Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BMATH4-301	Applied Mathematics – III	2	0	0	40	60	100	2
BASES1-301	Basics of Aeronautics	3	0	0	40	60	100	3
BASES1-302	Aerodynamics	3	0	0	40	60	100	3
BASES1-303	Basics of Thermodynamics	3	1	0	40	60	100	4
BASES1-304	Strength of Materials	3	1	0	40	60	100	4
BASES1-305	Aerodynamics Lab.	0	0	2	60	40	100	1
BASES1-306	Strength of materials lab	0	0	2	60	40	100	1
BASES1-307	Training–1 : 4 weeks Summer Training (Manufacturing practices)	-	-	-	60	40	100	2
Total 5 Theory & 2 Lab. Courses		**14**	**2**	**4**	**380**	**420**	**800**	**20**

BASICS OF AERONAUTICS

Subject Code –BASES1-301 **L T P Cr** **Duration:45 Hours**
3 0 0 3

COURSE OBJECTIVES

- To enable the student to understand prominent design features of Flight vehicle structures
- To enable the student to understand basic principles of flight along with historical developments.
- To enable the student to find basic flight performance and stability parameters of aircrafts.

LEARNING OUTCOMES

After undergoing the subject, student will be able to:

- Distinguish different components of aircrafts based on design features.
- Estimate aerodynamic performance of various Aerodynamic Shapes.
- Estimate basic flight parameters of aircrafts.
- Estimate power of propulsive devices of aircrafts.
- Distinguish different components of aircrafts navigation and communication systems.

DETAILED CONTENTS

UNIT –I (08 Hrs.)

1. **Basics of flight vehicles:** Classification of Flight Vehicles along with prominent design features, Importance of Strength/Weight Ratio, Loads on different parts of the Vehicle, detailed description of the Fuselage, Wing & Tail Surfaces, Wing Surfaces, Wing Fuselage Joining Methods, different types of Under Carriages, of Manned & Unmanned Space Vehicles Airplanes, Hovercraft, Helicopter & other V/STOL Machines along with examples. Historical Note: Very Early Flight vehicle Development, Sir George Caley, Otto Lilienthal, Percy Pilcher, Wilber and Orville Wright, The Aeronautical Triangle-Langley, the Wright and Glenn Curtiss.

UNIT-II (12 Hrs.)

2. **Airfoils, wings and other aerodynamic shapes:** Airfoil Nomenclature, Lift, Drag, and Moment, Airfoil Data, Infinite versus Finite wings, Pressure Coefficient, Lift coefficient from pressure coefficient, Compressibility Correction, Drag-Divergence Mach No., Wave Drag, Finite Wings, Calculation of Induced Drag, Change in the Lift Slope, Swept Wings, High Lift Flaps, Aerodynamics of cylinder and spheres, alternate explanation of Lift, Historical Note: Airfoils and Wings, The Wright Brothers, British and United States Airfoils(1910 to1920), 1920 to 1930, NACA series Digital Airfoils, Later Airfoils, Modern Airfoil , Finite Wings.

UNIT III (13 Hrs.)

3. **Basics of flight mechanics:** Equations of Motion, Thrust required for level Flight, Thrust available and Maximum velocity, Power required for level Flight, Power available and Maximum Velocity, Rate of Climb, Gliding Flight, Absolute and service Ceilings, Historical Note: Drag Reduction- Early Prediction of Airplane Performance.

   Definition of Stability and Control, Moments on the airplane, Criteria for Longitudinal Static Stability, Wing Contribution, tail Contribution, Static Stability equations, Neutral Point, Static Margin, Historical Note: Drag Reduction- Early Prediction of Airplane Performance, Wright Brothers versus the European philosophy on Stability and Control, The Development of Flight controls, Airplane Design-Evolution and Revolution.

UNIT-IV (12 Hrs.)

4. **Basics of aircraft propulsion:** Propeller, Reciprocating Engine, Jet Propulsion-The thrust Equations, Turbojet, Turbofan, Ramjet and Rocket Engine, Historical Note: Early Development of the Internal Combustion Engine for Aviation, Inventors of the Early Jet Engines, Early History of the Rocket Engine, Solid & liquid Propellant.

5. **Navigation & communication:** Different Navigation Methods, Dead Reckoning, Astronavigation, Ratio Aids, Positive Fixing, Related modern instruments. Instruments landing system, HF& VHF System, Simple Description of Communication Systems using Earth Station & Satellites.

INSTRUCTIONAL STRATEGY

Session Plan / course-material uploading, Visit to Aircraft Hanger, Class-room teaching associated with assignments, presentations, Videos, quiz, in-class tests, viva-voce and evaluation.

RECOMMENDED BOOKS

1 "Introduction to Flight", J. D. Anderson, 8th Edition, 2015
2 "Flight without Formulae", A. C. Kermode, Pitman Publishing; 4th revised edition, 1970
3 "Aerodynamics", L. J. Clancy, Wiley &Sons, 1975

VIDEOS

1. "Aerodynamics: Airfoil Camber, Flaps, Slots-Slats & Drag", Youtube Video
2 "How Airplanes Fly 1968 FAA Basic Aerodynamics ," Youtube Video
3 "Jet Engines, How it works?" ," Youtube Video
4 "Basic Aerodynamics"-CG and Stability," Youtube Video

AERODYNAMICS

Subject Code –BASES1-302 **L T P Cr** **Duration:45 Hours**
3 0 0 3

COURSE OBJECTIVES

- Differentiate between various types of fluid flow.
- Understand physical significance of Bernoulli's equation, momentum equation and Naiver-Stokes equations.
- Apply concepts of viscous flow to calculate laminar and turbulent boundary layer.

LEARNING OUTCOME

At the end of the course, the student will be able to:

- Classify flow in different categories on the basis of various parameters.
- Develop understanding of various significant non-dimensional numbers used in fluid dynamics.
- Evaluate aerodynamic properties of different planer bodies in inviscid flow theoretically.
- Develop governing equations of flow properties using different conservation principles.
- Find lift force over Joukowsky airfoils by Kutta-Joukowskytheorem.

DETAILED CONTENTS

UNIT – I (10 Hrs.)

1. **Introduction:** Dimensional analysis, units of measurements, similarity parameters, Buckingham-pi theorem, classifications of flow- Continuum and free molecular flows, inviscid and viscous flows, incompressible and compressible flows. Newtonian and Non-Newtonian flows. Streamlines, Pathlines, Streaklines, Pitot static tube, measurement of air-speed, pressure coefficient. Aerodynamic force and moments. Reynolds number.

UNIT – II (18 Hrs.)

2. **Kinematics and Dynamics of Fluid Flow:**Lagrangian and Eulerian methods, Description of properties in a moving fluid, Gradient of a scalar field , Divergence and Curl of a vector field, Line, Surface and Volume integrals and their relationship ,Finite control volume and molecular approach, Divergence of velocity.

   Equation of conservation of mass for control volume, special form of equation of conservation of mass, differential form of equation of conservation of mass, Euler's and Naiver-Stoke equations. Derivation of Bernoulli's equation for inviscid and viscous flow fields. Momentum equation in integral form. Application of momentum equation.

UNIT – III (10 Hrs.)

3. **Inviscid-Incompressible Flow:** Incompressible flow in a duct, Condition on velocity for incompressible flow. Laplace's equations. Vorticity and circulation, Potential function, stream function. Basic elementary flows: Uniform flows, source flow, Doublet flow and Vortex flow. Superimposition of elementary flows. Non-lifting and lifting flow over a circular cylinder, comparison with real flow over circular cylinder. Kutta-Joukowski theorem, generation of lift.

UNIT – IV (07Hrs.)

4. **Viscous flow:** Boundary layer concept, boundary layer properties, derivation of Prandtl's boundary layer equations, Blasius solution, Karman's Integral equation. Turbulent boundary layer over a plate, skin friction drag, boundary layer control.

INSTRUCTIONAL STRATEGY

Videos and images may be referred to explain basic concepts in a better way.

RECOMMENDED BOOKS

1. "Fundamentals of Aerodynamics", John D.Anderson(Jr.), McGraw Hill
2. "Fluid Mechanics", Frank M.White 2nd Edition., McGraw Hill
3. "Aerodynamics for Engineering Students", E.L.Houghton and P.W.Carpenter, 4th Edition., CBS Publishers , India

BASIC OF THERMODYNAMICS

Subject Code –BASES1-303 **L T P Cr** **Duration:60 Hours**
3 1 0 4

COURSE OBJECTIVES

- Explain thermodynamic terminology and concepts appropriately
- Define appropriate system boundaries for analyzing a variety of thermodynamic components and systems
- Determine and calculate the appropriate energy transfers and system properties to analyze closed system processes and cycles
- Determine and calculate the appropriate mass and energy transfers and properties to analyze steady-state control volume applications with any number of heat, work, or mass flows crossing the system boundary
- Determine and calculate appropriate mass and energy transfers and properties to analyze selected transient control volume applications
- Use tables, charts, equations, and software, in conjunction with appropriate property diagrams, to fix states of a pure substance and determine relationships among pressure, temperature, specific volume, internal energy, enthalpy and entropy

LEARNING OUTCOME

At the end of the course, the student will be able to:

- demonstrate that they can apply the principles of conservation of mass, conservation of energy, and the second law of thermodynamics to thermodynamic cycles.
- demonstrate the ability to analyze the performance of vapor and gas power cycles.
- demonstrate the ability to analyze the performance of vapor and gas refrigeration and heat pump cycles.
- Calculate states and performance parameters for vapor power cycles based on the Rankine cycle with superheat, reheat, and regeneration
- Use analytical techniques and/or computer tools (e.g. Matlab) to solve problems and display the results in graphical forms

UNIT – I (13Hrs.)

Fundamental Concepts & Definitions:

Thermodynamic definition and scope, Microscopic and Macroscopic approaches.Some practical applications of engineering thermodynamic Systems, Characteristics of system boundary and controlsurface, examples. Thermodynamic properties; definition and units, intensive , extensive properties, specific properties,pressure, specific volume Thermodynamic state, state point, state diagram, path and process, quasi-static process,cyclic and non-cyclic; processes;Thermodynamic equilibrium; definition, mechanical equilibrium; diathermic wall,thermal equilibrium, chemical equilibrium, Zeroth law of thermodynamics, Temperature; concepts, scales, internationalfixed points and measurement of temperature. Constant volume gas thermometer, constant pressure gasthermometer, mercury in glass thermometer

Work and Heat:

Mechanics, definition of work and its limitations. Thermodynamic definition of work; examples, signconvention. Displacement work; as a part of a system boundary, as a whole of a system boundary, expressions fordisplacement work in various processes through p-v diagrams. Shaft work; Electrical work.Other types of work.Heat;definition, units and sign convention. Problems

UNIT – II (16Hrs.)

First Law of Thermodynamics:

Joules experiments, equivalence of heat and work. Statement of the First law ofthermodynamics, extension of the First law to non - cyclic processes, energy, energy as a property, modes of energy,Extension of the First law to control volume; steady flow energy equation(SFEE), important applications.

Second Law of Thermodynamics:

limitations of first law of thermodynamics Devices converting heat to work; (a) in athermodynamic cycle, (b) in a mechanical cycle. Thermal reservoir,Direct heat engine; schematic representation andefficiency. Devices converting work to heat in a thermodynamic cycle; reversed heat engine, schematic representation,coefficients of performance. Kelvin - Planck statement of the Second law of Thermodynamics; PMM I and PMM II,Clausius

statement of Second law of Thermodynamics, Equivalence of the two statements; Carnot cycle, Carnotprinciples. Problems

Reversibility:
Definitions of a reversible process, reversible heat engine, importance and superiority of a reversible heatengine and irreversible processes; factors that make a process irreversible, reversible heat engines. Unresistedexpansion, remarks on Carnot's engine, internal and external reversibility, Definition of the thermodynamic temperaturescale. Problems

Entropy:
Clasius inequality, Statement- proof, Entropy- definition, a property, change of entropy, entropy as aquantitative test for irreversibility, principle of increase in entropy, calculation of entropy using Tds relations, entropyas a coordinate.

UNIT – III (16Hrs.)

Availability, Irreversibility and General Thermodynamic relations.
Introduction, Availability (Exergy), Unavailable energy(anergy), Relation between increase in unavailable energy and increase in entropy.Maximum work, maximum usefulwork for a system and control volume, irreversibility, second law efficiency (effectiveness). Gibbs and Helmholtzfunctions, Maxwell relations, Clapeyron equation, Joule Thomson coefficient, general relations for change in entropy,enthalpy, internal energy and specific heats.
Pure Substances:
P-T and P-V diagrams, triple point and critical points. Sub-cooled liquid, saturated liquid, mixture ofsaturated liquid and vapor, saturated vapor and superheated vapor states of pure substance with water as example.Enthalpy of change of phase (Latent heat).Dryness fraction (quality), T-S and H-S diagrams, representation of variousprocesses on these diagrams.Steam tables and its use.Throttling calorimeter, separating and throttling calorimeter.

UNIT – IV (15Hrs.)

Ideal gases:
Ideal gas mixtures, Daltons law of partial pressures, Amagat's law of additive volumes, evaluation ofproperties of perfect and ideal gases,Air- Water mixtures and related properties, Psychrometric properties, Construction and use of Psychrometric chart.
Real gases –
Introduction , Air water mixture and related properties, Van-der Waal\'s Equation of state, Van-der Waal\'sconstants in terms of critical properties, Redlich and Kwong equation of state Beattie-Bridgeman equation , Law ofcorresponding states, compressibility factor; compressibility chart.Difference between Ideal and real gases.

RECOMMENDED BOOKS

1. **An Introduction to Thermodynamics,** Y.V.C. Rao, University Press (India) Private Limited, Revised Edition, 2004).

2. **Thermodynamics: an Engineering Approach**, Y.A.Cengal and M.A.Boles, McGraw Hill (Fifth edition).
3. **Fundamentals of Classical Thermodynamics**, G.VanWylen, R.Sonntag and C.Borgnakke, John Willey & Sons (Fourth edition).

APPLIED MATHEMATICS-III

Subject Code: BMATH4-301 **L T P C** **Contact Hrs. 30**
2 0 0 2

(No. of lectures shown within brackets)

Transform Calculus

Unit-I

Module 8a: *Transform Calculus* -1
Polynomials – Orthogonal Polynomials – Lagrange's, Chebysev Polynomials; Trigonometric Polynomials, Laplace Transform, Properties of Laplace Transform, Laplace transform of periodic functions, Finding inverse Laplace transform by different methods, convolution theorem, Evaluation of integrals by Laplace transform, solving ODEs and PDEs by Laplace Transform method. (6)

Module 8b:*Transform Calculus*-2
Fourier transforms, Z-transform and Wavelet transforms: properties, methods, inverses and their applications. (4)

Discrete Mathematics

Unit-II

Module 9a:*Sets, relations and functions*:

Basic operations on sets, Cartesian products, disjoint union (sum), and power sets. Different types of relations, their compositions and inverses. Different types of functions, their compositions and inverses. (4)

Module 9b:*Propositional Logic:*

Syntax and semantics, proof systems, satisfiability, validity, soundness, completeness, deduction theorem, Decision problems of propositional logic, Introduction to first order logic and first order theory. (3)

Unit-III

Module 9c:*Partially ordered sets:*

Complete partial ordering, chain, lattice, complete, distributive, modular and complemented lattices, Boolean and pseudo Boolean lattices.

(3)

Module 9d:*Algebraic Structures:*

Algebraic structures with one binary operation – semigroup, monoid and group. Cosets, Lagrange's theorem, normal subgroup, homomorphic subgroup. Congruence relation and quotient structures. Error correcting code. Algebraic structures with two binary operations-ring, integral domain, and field. Boolean algebra and boolean ring (Definitions and simple examples only). (3)

Unit-IV

Module 9e:*Introduction to Counting:*

Basic counting techniques – inclusion and exclusion, pigeon-hole principle, permutation, combination, summations. Introduction to recurrence relation and generating functions.

(4)

Module 9f:*Introduction to Graphs:*

Graphs and their basic properties – degree, path, cycle, subgraph, isomorphism, Eulerian and Hamiltonian walk, trees.

(3)

Textbooks/References:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
3. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
4. Veerarajan T., Engineering Mathematics, Tata McGraw-Hill, New Delhi, 2008.
5. C. L. Liu, Elements of Discrete Mathematics, 2nd Ed., Tata McGraw-Hill, 2000.
6. R. C. Penner, Discrete Mathematics: Proof Techniques and Mathematical Structures, World Scientific, 1999.
7. R. L. Graham, D. E. Knuth, and O. Patashnik, Concrete Mathematics, 2nd Ed., Addison-Wesley, 1994.
8. K. H. Rosen, Discrete Mathematics and its Applications, 6th Ed., Tata McGraw-Hill, 2007.
9. J. L. Hein, Discrete Structures, Logic, and Computability, 3rd Ed., Jones and Bartlett, 2010.
10. N. Deo, Graph Theory, Prentice Hall of India, 1974.
11. S. Lipschutz and M. L. Lipson, Schaum's Outline of Theory and Problems of Discrete Mathematics, 2nd Ed., Tata McGraw-Hill, 1999.
12. J. P. Tremblay and R. P. Manohar, Discrete Mathematics with Applications to Computer Science, Tata McGraw-Hill, 1997.

STRENGTH OF MATERIALS

Subject Code –BASES1-304 **L T P Cr** **3 1 0 4** **Duration:60 Hours**

COURSE OBJECTIVES

- This course will make the students understand the concept of stress and strain in different types of structure/ machine underdifferent loading conditions.

- The course also covers the simple and compound stresses due to forces, stresses and deflection in beams due to bending, torsion in circular section, strain energy, different theories of failure, stress in thin cylinder thick cylinder and spheres due to external and internal pressure.

LEARNING OUTCOME

At the end of the subject, the student will be able to:

- Model and analyze the behaviour of structural and machine components subjected to various loading and support conditions based on principles of equilibrium and material constitutional relationships.
- Understand and apply the concept of stress and strain to analyze and design structural members and machine parts under axial load, shear load, bending moment and torsional moment.
- Solve practical problems through evaluating the relationship between stress and strain.
- Analyse composite beams and shafts
- Determine the deflections and deformations of loaded flexural members.
- Analyze a structural member and machine part when loaded beyond elastic limit (inelastic and plastic cases).

DETAILED CONTENTS

UNIT –I (16Hrs.)

1. Simple stresses and strains : Concept of stress and strain; St. Vernants principle, stress and strain diagram, Hooke's law, Young's modulus, Poisson ratio, stress at a point, stress and strains in bars subjected to axial loading. Modulus of elasticity, stress produced in compound bars subject to axial loading. Temperature stress and strain calculations due to applications of axial loads and variation of temperature in single and compound bars. Compound stress and strains, the two dimensional. system; stress at a point on a plane, principal stresses and principal planes; Mohr's circle of stress; ellipse of stress and their applications. Generalized Hook's Law, principal stresses related to principal strains

UNIT –II (16 Hrs.)

2. Bending moment and shear force diagrams: S.F and B.M definitions. BM and SF diagrams for cantilevers, simply supported beams with or without overhangs and calculation of maximum BM and SF and the point of contra-flexure under the following loads:

a) Concentrated loads
b) Uniformity distributed loads over the whole span or part of span
c) Combination of concentrated loads (two or three) and uniformly distributed loads
d) Uniformity varying loads
e) Application of moments
f) Relation between rate of loading, shear force and bending moment

3. Theory of bending stresses in beams due to bending: assumptions in the simple bending theory, derivation of formula: its application to beams of rectangular, circular and channel, I & T-sections,: Combined direct and bending stresses in aforementioned sections, composite / flitched beams.

UNIT –III (16 Hrs.)

4. Torsion: Derivation of torsion equation and its assumptions. Applications of the equation to the hollow and solid circular shafts, torsional rigidity, combined torsion and bending of circular

shafts principal stress and maximum shear stresses under combined loading of bending and torsion, analysis of close-coiled-helical springs.

5. Thin cylinders and spheres : Derivation of formulae and calculation of hoop stress, Longitudinal stress in a cylinder, effects of joints, change in diameter, length and internal volume; principal stresses in sphere and change in diameter and internal volume

UNIT –IV (12 Hrs.)

6. Columns and struts : Columns and failure of columns : Euler's formulas; Rankine- Gordon's formula, Johnson's empirical formula for axially loaded columns and their applications.

7. Slope and deflection: Relationship between moment, slope and deflection, Moment area method; method of integration; Macaulay's method: Use of all these methods to calculate slope and deflection for the following :

a) Cantilevers

b) Simply supported beams with or without overhang

c) Under concentrated loads, uniformly distributed loads or combination of concentrated and uniformly distributed loads

INSTRUCTIONAL STRATEGY

The course pedagogy will include lectures, numerical practice, seminars and presentations. It also includes discussion on real life problems related to design of mechanical components which includes all types of stresses. The teachers should demonstrate the following experiments to the students in the Strength of Materials Lab:-

Tensile Test (MS), Compression Test (CI), Brinell Hardness No., Izod Impact, Rockwell Hardness Tester, Spring Stiffness (Spring Compression Testing Machine), Torsion Testing Machine.

RECOMMENDED BOOKS

1. Introduction to Solid Mechanics by D.H Shames, Prentice Hall Inc. 2010
2. Elements of strength of Materials by Timoshenko and Young 2010
3. Strength of Materials by DS Bedi; Khanna book Publishing Company, 2014
4. Strength of materials by R.S Lehri and A.S. Lehri, S.K Kataria and Sons. 2014
5. Strength of Materials by Ferdinand P Singer and Andrew Pytel,Harper and Row H. Kogakusha Publishers, New York
6. Mechanics of Materials by SI Version, end edition by Ferdinand P. Beer and E Russel Johnston (Jr); McGraw Hill, India
7. Mechanics of Materials-SI Version 2nd Edition by EP Popov, Prentice Hall India

AERODYNAMICS LAB

Subject Code –BASES1-305 **L T P Cr** **Duration:30 Hours**
0 0 2 1

COURSE OBJECTIVES

- Select appropriate experimental techniques to study the aerodynamic characteristics of any body.
- Interpret experimental result.

DETAILED CONTENTS

1. Visualization and plotting streamlines of flow field around Symmetric Airfoil and cambered airfoil at subsonic speed in smoke tunnel. Repeat the experiment for three different angles of attack.
    a. Negative angle of attack (say -5^o)
    b. Zero lift angle of attack
    c. Positive angle of attack of small value, say 5^o
    d. Stall angle of attack (i.e. > 15^o)
2. Identification and plotting different flow structure (wing tip vortices, downwash region, up-wash region, trailing edge wake) around finite wing using smoke at subsonic speed in wind tunnel.
3. Visualization of flow using smoke at subsonic speed around delta wing in wind tunnel.
4. Obtain vortex shedding frequency vs speed plot for Von-Karman vortex around circular non-rotating cylinder in smoke tunnel at subsonic speed.
5. Calculating rotational speed of cylinder for fixed incoming freestream velocity at which
    a. Two stagnation points are obtained
    b. One stagnation point is obtained
    c. No stagnation point is obtained on the surface of cylinder

    Use smoke tunnel for this experiment. Repeat this experiment for at least three different velocity.
6. Calculating angle of attack at which flow separates over the surface of aircraft using tufts in wind tunnel. Identify the regions over the aircraft surface where flow remains separated at relatively low angles of attack.
7. Visualization and plotting of flow separation process and wing tip vortices around 3D wing at different angle of attack using tufts in wind tunnel.
8. Plotting the flow field, using oil pattern, around airfoil at different angle of attack in wind tunnel.

RECOMMENDED BOOKS

1. “Low speed wind tunnel testing”, Jewel B. Barlow, John Wiley & sons
2. “Experimental Aerodynamics”, Henry Christensen, Pavian,Pitman Publishing
3. “Wind Tunnels: Aerodynamics, Models & Experiments (Engineering Tools, Techniques and Tables)”, Justin D. Pereira.

MEANS OF ASSESSMENT

Actual laboratory and practical work, model/prototype making, assembly and disassembly exercises and viva-voce.

STRENGTH OF MATERIALS LAB

Subject Code –BASES1-306 **L T P Cr** **Duration:30 Hours**
0 0 2 1

OBJECTIVES

To supplement the theoretical knowledge gained in Strength of Materials with practical testing for determining the strength of materials under externally applied loads. This would enable the student to have a clear understanding of the design for strength and stiffness

LIST OF EXPERIMENTS

1. Tension test on a mild steel rod
2. Double shear test on Mild steel and Aluminium rods
3. Torsion test on mild steel rod
4. Impact test on metal specimen
5. Hardness test on metals - Brinnell and Rockwell Hardness Number
6. Deflection test on beams
7. Compression test on helical springs
8. Strain Measurement using Rosette strain gauge
9. Effect of hardening- Improvement in hardness and impact resistance of steels.
10. Tempering- Improvement Mechanical properties Comparison

    a) Unhardened specimen
    b) Quenched Specimen and

11. Quenched and tempered specimen. Microscopic Examination of
    a) Hardened samples and
    b) Hardened and tempered samples.

MEANS OF ASSESSMENT

Actual laboratory and practical work, model/prototype making, assembly and disassembly exercises and viva-voce.

*NOTE: Workshop Training will be imparted in the Institution at the end of 2nd semester for Four (04) weeks duration (Minimum 36 hours per week).students will learn manufacturing practices. Students will also undergo training of 3D CAD modeling software (SOLIDWORKS). Students are required to be involved in Inter/ Intra Institutional Activities viz; Training with higher Institutions; Soft skill training organized by Training and Placement Cell of the respective institutions; contribution at incubation/innovation /entrepreneurship cell of the institute; participation in conferences/ workshops/ competitions etc.