COURSE STRUCTURE AND DETAILED SYLLABUS

for

II B.TECH

MECHANICAL ENGINEERING

(Applicable for the batches admitted from 2016-17)

GURU NANAK INSTITUTIONS TECHNICAL CAMPUS
(An Autonomous Institution)
Campus: Ibrahimpatnam, R.R. District – 501 506

GURU NANAK INSTITUTIONS TECHNICAL CAMPUS (AUTONOMOUS)

CONTENTS

II YEAR I SEMESTER

II YEAR II SEMESTER

COURSE STRUCTURE
II B. Tech. Mechanical Engineering

II YEAR - I SEMESTER

S. No	Sub Code	Group	Subject	L	T	P	Credits
1	HM031	BS	Mathamatics- III	4	1	0	4
2	ME0321	PC	Metallurgy & Material Science	3	0	0	3
3	ME0322	PC	Mechanics of Solids	3	1	0	3
4	ME0323	PC	Thermodynamics	3	1	0	3
5	ME0324	PC	Kinematics of Machines	3	1	0	3
6	ME0325	PC	Machine Drawing practice	2	0	3	3
7	ME0326	PC	Mechanics of Solids & Metallurgy Lab	0	0	3	1
8	ME0327	PC	Fuels & lubricants Lab	0	0	3	2
9	GN0392	HS	Human Values and Professional Ethics	2	0	0	2
			Total Credits				24

Library=1, sports=1, NPTEL/Student activities =2

II YEAR - II SEMESTER

S. No	Sub Code	Group	Subject	L	T	P	Credits
1	ME0421	PC	Fluid Mechanics & Hydraulic Machinery	4	1	0	4
2	ME0422	PC	Thermal Engineering-I	4	1	0	4
3	ME0423	PC	Dynamics of Machines	4	1	0	4
4	ME0424	PC	Production Technology	3	0	0	3
5	ME0425	PC	Instrumentation & Control Systems	3	0	0	3
6	GN0491	HS	Gender Sensitization Lab	-	-	-	-
7	ME0426	PC	Fluid Mechanics & Hydraulic Machinery Lab	0	0	3	2
8	ME0427	PC	Instrumentation & control system Lab	0	0	3	2
9	ME0428	PC	Production Technology Lab	0	0	3	2
			Total Credits				24

Library=1, sports=1, NPTEL/Student activities =2

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II Year B. Tech. EEE I-Sem

L	T	P	C
4	1	0	4

(HM0311) MATHEMATICS – III

Pre Requisites: Nil

Course Objectives:

- To enable the students to understand the concepts of probability distributions, statistical Inferences, and testing of hypothesis.
- To enable the students to understand the key concepts of Complex functions and the calculus of complex functions.

Outcomes:

- The student achieves the knowledge to testing the hypothesis and forms the probability distributions to make inferences.
- The students can study some problems of engineering using the concepts of residue theorem, Laurent series of functions of complex variables.

Syllabus:

UNIT-I: Single Random variables and probability distributions.

Random variables – Discrete and continuous. Probability distributions, mass function/ density function of a probability distribution. Mathematical Expectation, Moment about origin, Central moments Moment generating function of probability distribution. Binomial, Poisson & normal distributions and their properties. Moment generating functions of the above three distributions. And hence finding the mean and variance.

UNIT-II: Multiple Random variables, Correlation & Regression

Joint probability distributions- Joint probability mass / density function, Marginal probability mass / density functions, Covariance of two random variables, Correlation - Coefficient of correlation, the rank correlation. Regression- Regression Coefficient, The lines of regression and multiple correlation & regression.

UNIT-III: Sampling Distributions and Testing of Hypothesis Sampling: Definitions of population, sampling, statistic, parameter. Types of sampling, Expected values of Sample mean and varience, sampling distribution, Standard error, Sampling distribution of means and sampling distribution of varience.

Parameter estimations – likelihood estimate, interval estimations.

Testing of hypothesis: Null hypothesis, Alternate hypothesis, type I, & type II errors – critical region, confidence interval, and Level of significance. One sided test, two sided test,

Large sample tests:

(i) Test of Equality of means of two samples equality of sample mean and population mean (cases of known varience & unknown varience, equal and unequal variances)

(ii) Tests of significance of difference between sample S.D and population S.D.

(iii) Tests of significance difference between sample proportion and population proportion & difference between two sample proportions.

Small sample tests:

Student t-distribution,its properties; Test of significance difference between sample mean and population mean; difference between means of two small samples

Snedecor's F- distribution and it's properties. Test of equality of two population variences

Chi-square distribution , it's properties, Chi-square test of goodness of fit.

UNIT-IV: Functions of Complex Variables

Complex functions and its representation on Argand plane, Concepts of limit Continuity, Differentiability, Analyticity, Cauchy-Riemann conditions, Harmonic functions – Milne – Thompson method.

Line integral – Evaluation along a path and by indefinite integration – Cauchy's integral theorem – Cauchy's integral formula – Generalized integral formula.

Radius of convergence – Expansion in Taylor's series, Maclaurin's series and Laurent series. Singular point –Isolated singular point – pole of order m – essential singularity

UNIT – V: C**ontour Integration**

Residue – Evaluation of residue by formula and by Laurent series – Residue theorem.

Evaluation of integrals of the type

(a) Improper real integrals $\int_{-\infty}^{\infty} f(x)dx$ (b) $\int_{c}^{c+2\pi} f(\cos\theta,\sin\theta)d\theta$

Conformal mapping.

Transformation of z-plane to w-plane by a function, Conformal transformation. Standard transformations- Translation; Magnification and rotation; inversion and reflection, Transformations like e^z, log z, z^2, and Bilinear transformation. Properties of Bilinear transformation, determination of bilinear transformation when mappings of 3 points are given .

Text Books:

1) Fundamentals of mathematical statistics by s c gupta and v.k.kapoor
2) Probability and statistics for engineers and scientists by sheldon m.ross,academic press
3) Probability and statistics for engineering and the sciencec by jay l.devore.
4) Higher engineering mathematics by b s grewal.
5) Advanced engineering mathematics by peter v o'neil, cengage learning
6) Engineering mathematics by erwin kreyszig,10th edition wiely publications

References:

1) Mathematics for engineers series –probability statistics and stochastic process by k.b.datta and m.a s.srinivas,cengage publications
2) Probability, statistics and stochastic process by prof.a r k prasad., wiely india
3) Advanced engineering mathematics by sahanaz bathul, phi publication
4) Probability and statistics by t.k.v.iyengar &b.krishna gandhi etel
5) Mathematics for engineers series- advanced mathematics for engineers by k.b.datta and m.a s.srinivas, cengage publications
6) Advanced engineering mathematics for engineers by prof.a r k prasad., wiely india

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II Year B. Tech. ME I-Sem

L	T	P	C
3	0	0	3

(ME0321) Metallurgy & Material Science

Pre Requisites:

Objectives:

- The purpose of this course is to learn the Structural & Mechanical properties of various important Engineering materials.
- To introduce the concepts & skills required for the Heat treatment of steels and other Heat treatable non-ferrous alloys such as Cu- alloys; Al-alloys; Titanium alloys.

Outcomes:

- Apply the knowledge of Physical sciences (basic sciences) and translates this knowledge to understand crystal or amorphous nature of materials various engineering materials, their characteristics and their applications
- Understand fundamental knowledge of the Mechanical properties of various engineering materials: Metal, Ceramics, Plastics and Composites.
- Observe and develop the skill of selection of a particular material and a particular mechanical properties is to be exploited for the “manufacturing Techniques’. The principles of Heat Treatment and design of Heat treatment methods for steels, Non-ferrous materials.

Syllabus:

UNIT I:

Structure of Metals : Bonds in Solids –Slip systems, Metallic bond - crystallization of metals, single and poly crystals, grain and grain boundaries, effect of grain boundaries on the properties of metal / alloys –dislocation theory & slip phenomenon, determination of grain size. Constitution of Alloys : Types of solid solutions, Hume Rotherys rules, intermediate alloy phases, and electron compounds, theory of strain hardening

UNIT II :

Equilibrium of Diagrams : Experimental methods of construction of equilibrium diagrams, Isomorphous alloy systems, equilibrium cooling and heating of alloys, Lever rule, coring miscibility gaps, eutectic systems, congruent melting intermediate phases, peritectic reaction. Transformations in the solid state – allotropy, eutectoid, peritectoid reactions, phase rule, relationship between equilibrium diagrams and properties of alloys. Study of important binary phase diagrams of Cu-Ni-, Al-Cu, Bi-Cd, Cu-An, Cu-Sn and Fe-Fe_3C.

UNIT III:

Cast Irons and Steels: Structure and properties of White Cast iron, Malleable Cast iron, grey cast iron, Spheroidal graphite cast iron, Alloy cast irons. Classification of steels, structure and properties of plan carbon steels, Low alloy steels, Hadfield manganese steels, tool and die steels. Types of fracture theory of fracture, fatigue & creep fracture surfaces and their identification

UNIT IV:

Heat treatment of Alloys : Effect of alloying elements on Fe-Fe3C system, Annealing, normalizing, Hardening, TTT diagrams, tempering , Hardenability surface - hardening methods, Age hardening treatment, Cryogenic treatment of alloys. Non-ferrous Metals and Alloys : Structure and properties of copper and its alloys, Aluminium and its alloys, Phase diagrams of Al – Cu. Phase diagrams of Al – Cu. Titanium and its alloys.

UNIT V :

Ceramic materials : Crystalline ceramics, glasses, cermaets, abrasive materials, nonomaterials – definition, properties and applications of the above.Composite materials : Classification of composites, various methods of component manufacture of composites, particle – reinforced materials, fiber reinforced materials, metal ceramic mixtures, metal – matrix composites and C – C composites. Properties & applications of composites.

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L	T	P	C
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MECHANICS OF SOLIDS (ME0322)

Course Objectives :

1. Understand the concepts of stress and strain in mechanics of solids and structures and material properties.
2. Apply the fundamental concepts of principle of superposition, equilibrium, compatibility, and force-deformation.
3. Understand the method of superposition, flexibility method, and stiffness method as applied to statically determinate and indeterminate axial and torsional members, and beams.
4. Design structural members given the dimensions, material properties such as force-displacement relationships, boundary conditions, loading allowable stresses, and factor of safety.

Course Outcomes:

- Will be able to understand the concepts of stress and strain in mechanics of solids and structures and material properties.
- Will be able to apply the fundamental concepts of principle of superposition, equilibrium, compatibility, and force-deformation.
- Will be able to understand the method of superposition, flexibility method, and stiffness method as applied to statically determinate and indeterminate axial and torsional members, and beams.
- Will be able to design structural members given the dimensions, material properties such as force-displacement relationships, boundary conditions, loading allowable stresses, and factor of safety.

UNIT 1 :

SIMPLE STRESSES AND STRAINS : Elasticity and plasticity – Types of stresses and strains – Hooke's law – stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio and volumetric strain – Elastic moduli and the relationship between them – Bars of varying section – composite bars – Temperature stresses. Strain energy – Resilience – Gradual, sudden, impact and shock loadings

UNIT-2 :

SHEAR FORCE AND BENDING MOMENT : Definition of beam – Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilver, simply supported and overhanging beams subjected to point loads , u.d.l, uniformly varying loads and combination of these loads – Point of contraflexure – Relation

between S.F., B.M and rate of loading at a section of a beam. Concept of principal stress & principal strain, mohr's circle & its applications.

UNIT-3 :

FLEXURAL STRESSES:

Theory of simple bending – Assumptions Derivation of bending equation : M/I=f/y=E/R Neutral axis – Determination bending stresses – section modules of rectangular and circular sections (Solid and Hollow), I,T,Angle and Channel sections – Design of simple beam sections.

Shear Stresses : Derivation of formula – Shear stress distribution across various beams sections like rectangular, circular, triangular, I, T angle sections. Torsion in shafts. Derivation of $T/J = q/R = C\theta/l$, combined bending , Torsion and end thrust in shafts .

UNIT-4 :

ANALYSIS OF PIN-JOINTED PLANE FRAMES : Determination of Forces in members of plane, pin-joined, perfect trusses by (i) method of joints and (ii) method of sections. Analysis of various types of cantilever and simply – supported trusses – by method of joints, method of sections and tension coefficient methods.

DEFLECTION OF BEAMS : Bending into a circular arc – slope, deflection and radius of curvature – Differential equation for the elastic line of a beam – Double integration and Macaulay's methods – Determination of slope and deflection for cantilever and simply supported beams subjected to point loads, - U.D.L. uniformly varying load. Mohr's theorems – Moment area method – application to simple cases including overhanging beams.

UNIT-5 :

THIN CYLINDERS: Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and volumetric strains – changes in dia, and volume of thin cylinders – Riveted boiler shells – Thin spherical shells.

Thick Cylinders – lame's equation – cylinders subjected to inside and out side pressures – compound cylinders. Various theories of failures, Von Mises theory, maximum principal stress & maximum principal strain theories.

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THERMODYNAMICS (ME0323)

Course Objectives:

1. Understand fundamentals of thermodynamic analyses
2. Understand the various laws of thermodynamics
3. Effectively generalize the basic axioms of classical, macroscopic thermodynamic analysis and to extrapolate those concepts to systems and substances not necessarily covered specifically in the Manufacturing systems.
4. Understand the various power cycles and refrigeration cycles in various engineering applications
5. Identify and formulate elementary level engineering problems related to thermodynamics and energy transformation in a conceptual form as well as in terms of arithmetical/physical models.

Course Outcomes:

1. Will be able to apply basic principles of thermodynamics, Zeroth law, First law and Second law estimate the various-mechanical energy conversions in various power and propulsion systems
2. Will be able to apply the entropy principles and Third law of thermodynamics
3. Will be able to analyze the pure substance ,mollier charts, various perfect gas laws
4. Will be able analyze the various flow and non flow process
5. Will be able to Analyze the refrigeration and air conditioning principles and Vapour power cycles.

UNIT-I:

Introduction: Basic Concepts: System, Control Volume, Surrounding, Boundaries, Universe, Types of Systems, Macroscopic and Microscopic viewpoints, Concept of Continuum, Thermodynamic Equilibrium, State, Property, Process, Exact & Inexact Differentials, Cycle – Reversibility – Quasi – static Process, Irreversible Process, Causes of Irreversibility – Energy in State and in Transition, Types, Displacement & Other forms of Work, Heat, Point and Path functions, Zeroth Law of Thermodynamics – Concept of Temperature – Principles of Thermometry – Reference Points – Const. Volume gas Thermometer – Scales of Temperature, Ideal Gas Scale.

UNIT-II:

PMM I - Joule's Experiments – First law of Thermodynamics – Corollaries– First law applied to a Process – applied to a flow system – Steady Flow Energy Equation.
Limitations of the First Law – Thermal Reservoir, Heat Engine, Heat pump, Parameters of performance, Second Law of Thermodynamics, Kelvin-Planck and Clausius

Statements and their Equivalence / Corollaries, PMM of Second kind, Carnot's principle, Carnot cycle and its specialties, Thermodynamic scale of Temperature, Clausius Inequality, Entropy, Principle of Entropy Increase – Energy Equation, Availability and Irreversibility –Thermodynamic Potentials, Gibbs and Helmholtz Functions, Maxwell Relations, Reciprocal & cyclic relations, property relations, heat capacity relations – Elementary Treatment of the Third Law of Thermodynamics.

UNIT-III:

Pure Substances, p-V- T- surfaces, T-S and h-s diagrams, Mollier Charts, Phase Transformations – Triple point at critical state properties during change of phase, Dryness Fraction –. Law of corresponding states. Clausius – Clapeyron Equation, concept of entropy, Property tables. Mollier charts – Various Thermodynamic processes and energy Transfer – Steam Calorimeter.

Perfect Gas Laws – Equation of State, specific and Universal Gas constants – various Non flow processes, properties, end states, Heat and Work Transfer, changes in Internal Energy – Throttling and Free Expansion Processes – Flow processes.

UNIT-IV:

Deviations from perfect Gas Model – Vader Waals Equation of State – Compressibility Factor, compressibility chart. Variable specific Heats – Gas Tables.

Mixtures of perfect Gases – Mole Fraction, Mass friction Gravimetric and volumetric Analysis – Dalton's Law of partial pressure, Avogadro's Laws of additive volumes – Mole fraction , Volume fraction and partial pressure, Equivalent Gas const. And Molecular Internal Energy, Enthalpy, sp. Heats and Entropy of Mixture of perfect Gases and Vapour, Atmospheric air - Psychrometric Properties – Dry bulb Temperature, Wet Bulb Temperature, Dew point Temperature, Thermodynamic Wet Bulb Temperature, Specific Humidity, Relative Humidity, saturated Air, Vapour pressure, Degree of saturation – Adiabatic Saturation , Carrier's Equation – Psychrometric chart.

UNIT-V:

Power Cycles : Otto, Diesel, Dual Combustion cycles, Sterling Cycle, Atkinson Cycle, Ericsson Cycle, Lenoir Cycle – Description and representation on P–V and T-S diagram, Thermal Efficiency, Mean Effective Pressures on Air standard basis – comparison of Cycles.

Refrigeration Cycles: Brayton and Rankine cycles – Performance Evaluation – combined cycles, Bell-Coleman cycle, Vapour compression cycle-performance Evaluation. Vapor Absorption refrigeration Refrigerants & their properties.

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II Year B. Tech. ME I-Sem

L	T	P	C
3	1	0	3

Kinematics of Machines (ME0324)

COURSE PRE-REQUISITES:

The Fundamental Concepts of Forces, Moments, the center of gravity, statics & dynamics force systems on rigid bodies.
The concepts of stress & strain different types of stresses, bending stresses, Torsional shear stresses stresses in cylinders thin & thick, bending moments & shear forces analysis.

Course Objectives:

1. **Understands** the common mechanisms used in machines and everyday life.
2. **Develop** the mechanism for given task within constrain.
3. **Formulate** the mobility (number of degrees-of-freedom). Enumeration of rigid links and types of joints within mechanisms.
4. **Solve** various kinematics analysis of a real-world mechanism.
5. **Design** the whole mechanism and the assemblies the mechanisms into a M/c

Course Outcomes:

1. Familiarity with common mechanisms used in machines and everyday life.
2. Ability to calculate mobility (number of degrees-of-freedom) and enumerate rigid links and types of joints within mechanisms.
3. Ability to conduct a complete (translational and rotational) mechanism
4. Ability to do cam mechanism classification and cam motion profiles, and familiarity with introductory cam design considerations. (P)
5. Ability to do gear mechanism classification and gear train analysis, and familiarity with gear standardization and specification in design.

UNIT-I :

Mechanisms : Elements or Links – Classification – Rigid Link, flexible and fluid link – Types of kinematics pairs – sliding, turning, rolling, screw and spherical pairs – lower and higher pairs – closed and open pairs – constrained motion – completely, partially or successfully and incompletely constrained .
Mechanism and Machines – Mobility of Mechanisms : Grubler's criterion, classification of machines – kinematics chain – inversions of mechanism – inversions of quadric cycle chain, single and double slider crank chains, Mechanical Advantage. Crank & slotted lever quick return mechanism,& inventions of double slider crank chain.

UNIT-II :

Kinematics: Velocity and acceleration – Motion of link in machine – Determination of Velocity and acceleration – Graphical method – Application of relative velocity method.

Plane motion of body: Instantaneous center of rotation- centrodes and axodes – Three centers in line theorem – Graphical determination of instantaneous center, determination of angular velocity of points and links by instantaneous center method.

Khien's construction - Coriolis acceleration - determination of Coriolis component of acceleration

Analysis of Mechanisms: Analysis of slider crank chain for displacement- velocity and acceleration of slider – Acceleration diagram for a given mechanism. Khien's construction, coriolis acceleration steering mechanisms.

UNIT-III :

Straight-line motion mechanisms: Exact and approximate copied and generated types – Peaucellier - Hart - Scott Russel – Grasshopper – Watt -Tchebicheff's and Robert Mechanism - Pantographs

Steering gears: Conditions for correct steering – Davis Steering gear, Ackerman's steering gear.

Hooke's Joint: Single and double Hooke's joint –velocity ratio – application – problems.

UNIT-IV :

Cams: Definitions of cam and followers – their uses – Types of followers and cams – Terminology – Types of follower motion - Uniform velocity, Simple harmonic motion and uniform acceleration and retardation. Maximum velocity and maximum acceleration during outward and return strokes in the above 3 cases.

Analysis of motion of followers: Tangent cam with Roller follower – circular arc cam with straight, concave and convex flanks. Belt, Rope and chain Drives. Tensions for flat belt drive, angle of contact, slip& creep in belts. Maximum Tension of belt. Classifications of chains & length of chain.

UNIT-V:

Higher pair: Friction wheels and toothed gears – types – law of gearing, condition for constant velocity ratio for transmission of motion – velocity of sliding

Forms of teeth, cycloidal and involutes profiles – phenomena of interferences – Methods of interference. Condition for minimum number of teeth to avoid interference – expressions for arc of contact and path of contact of Pinion & Gear and Pinion & Rack Arrangements– Introduction to Helical – Bevel and worm gearing

Gear Trains: Introduction – Types – Simple – compound and reverted gear trains – Epicyclic gear train. Methods of finding train value or velocity ratio of Epicyclic gear trains. Selection of gear box - Differential gear for an automobile. Ram diagram for gear & speed ratio.

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II Year B. Tech. ME I-Sem

L	T	P	C
2	0	3	3

Machine Drawing practice (ME0325)

Course Objectives:

1. In the machine drawing we can study about.
2. To Use the techniques and able to interpret the drawing in Engineering field.
3. To know the significance & use of tolerances of size, forms & positions.
4. Read and prepare machine drawings,
5. Correctly dimension views,
6. Describe fits and tolerances, surface texture and geometric tolerances

Course Outcomes:

1. Understand various conventions used in machine drawing
2. Prepare the assembly drawings from component drawing.
3. Understand the use of various machine components.
4. Interpret and make conclusions about a given drawing.

UNIT-I:

1. Conventional representation of materials, common machine elements and parts such as screws, nuts, bolts, keys, gears, webs, ribs.
2. Types of sections – selection of section planes and drawing of sections and auxiliary sectional views. Parts not usually sectioned.
3. Methods of dimensioning, general rules for sizes and placement of dimensions for holes, centers, curved and tapered features.
4. Title boxes, their size, location and details - common abbreviations and their liberal usage
5. Types of Drawings – working drawings for machine parts.

UNIT-II:

6. Popular forms of Screw threads, bolts, nuts, stud bolts, tap bolts, set screws.
7. Keys, cottered joints and knuckle joint.
8. Rivetted joints for plates
9. Shaft coupling, spigot and socket pipe joint.
10. Journal, pivot and collar and foot step bearings.

UNIT-III:

11. Steam engine parts – stuffing boxes, cross heads, Eccentrics.
12. Machine tool parts: Tail stock, Tool Post, Machine Vices.
13. Other machine parts - Screws jacks, Petrol engine connecting rod, Plummer block
14. Simple designs of steam stop valve, spring loaded safety valve, feed check valve and air cock.

II Year B. Tech. ME I-Sem

L	T	P	C
0	0	3	1

Mechanics of Solids & Metallurgy Lab (ME0326)

Pre-requisites: Chemistry & Physics

Course Outcomes:

At the end of the course, the student will be able to Conduct tension test on steel, aluminium, copper and brass. Perform compression tests on spring and wood.Determine elastic constants using flexural and torsion tests. Determine hardness of metals

MECHANICS OF SOLIDS LAB

List of Experiments:

1. To study the stress -strain characteristics of (a) Mild Steel and (b) Tor steel by conducting tension test on U.T.M
2. To study the stress - strain characteristics of (a) Copper and (b) Aluminium by conducting tension test on Hounsfield Tensometer
3. To find the Compressive strength of wood and punching shear strength of G.I. sheet by conducting relevent tests on Housfield Tensometer
4. To find the Brinnell's hardness numbers of (a) Steel (b) Brass (c) Aluminium (d) Copper by conducting hardness test.
5. To determine the Modulus of rigidity by conducting Torsion test on (a) Solid shaft (b) Hollow shaft
6. To find the Modulus of rigidity of the material of a spring by conducting Compression test.
7. To determine the Young's modulus of the material by conducting deflection test on a simply supported beam.
8. To determine the Modulus of elasticity of the material by conducting deflection test on a Propped Cantilever beam.
9. To determine the Modulus of elasticity of the material by conducting deflection test on a continuous beam
10. Ductility test for steel
11. Shear test on Mild Steel rods

METALLURGY LAB

1. Preparation and study of Crystal models.
2. Study of: Specimen cutting machine Specimen mounting press Grinding and polishing equipment
3. Study of various Metallurgical Microscopes and use of leveling press

4. Metallographic preparation of ferrous specimen for Microscopic examination
5. Preparation of non-ferrous specimen for Metallographic examination
6. Preparation and Metallographic study of pure metals like Iron, Copper and Aluminium.
7. Measurement of lattice parameters of various crystal structures and calculation of packing factors and size of vacancies.
8. Identification of Microstructures of steels.
9. Estimation of Carbon content of steels using metallurgical microscope and Spark test.Thermal analysis.

II Year B. Tech. ME I-Sem

L	T	P	C
0	0	3	2

Fuels & lubricants Lab (ME0327)

Prerequisite: Chemistry

Objectives: To Understand the fuel and lubricants properties

1. Determination of Flash and Fire points of Liquid fuels/Lubricants.
2. Carbon residue test: Liquid fuels.
3. Determination of Viscosity: Liquid lubricants.
4. Determination of Calorific value: Solid/Liquid/Gaseous fuels.
5. Greese penetration test.
6. Viscosity determination by Redwood & Saybolt methods.
7. Bomb/ Junkers Gas Calorimeter.

II Year B. Tech. ME I-Sem

L	T	P	C
2	0	0	2

Human Values and Professional Ethics (GN0392)

Unit I

Human Values: Morals, values, ethics – integrity – work ethics –service learning –civic virtue – respect for others- living peacefully - Caring –sharing –honesty – courage – valuing time – cooperation – commitment –empathy – self-confidence –spirituality – character- Mini-Cases

Unit II

Professional Ethics: Profession- and professionalism - Two models of professionalism –Professional etiquette -Three types of Ethics or morality Responsibility in Engineering – Engineering standards –Engineering Ethics – Positive and Negative Faces. Professional Codes and Code of conduct (as given by ASME, ASCE, IEEE, IETE, Institute of Engineers as Guidelines for ethical conduct). Mini-cases.

Unit III

Professional Responsibilities: Ethical standards Vs Professional Conduct – Zero Tolerance for Culpable Mistakes – Hazards and Risks- Risk benefit analysis– congeniality, collegiality and loyalty. Respect for authority – conflicts of interest – occupational crime ––Mini-Cases.

Unit IV

Professional Rights: professional rights and employee rights communicating risk and public policy – Whistle blowing - collective bargaining. Professionals /engineers as managers, advisors, experts, witnesses and consultants – moral leadership- Regulatory compliances, Monitoring and control- Mini-Cases

Unit V

Ethics in global context: Global issues in MNCs- Problems of bribery, extortion, and grease payments – Problem of nepotism, excessive gifts – paternalism – different business practices – negotiating taxes. Mini-Cases.

Mini-projects

Project 1: The student of this course should invariably attend (or watch on internet/any TV channel/youtube/social media) two speeches of 30 minutes duration each dealing with spiritual discourse and submit a report on the contents of the lecture proceedings.

Project 2: Visit any organization (including shops/ hotels or shopping malls in your region) of your choice and observe how the professionals perform the given job with a focus on professional ethics and human values.

References

1. Aryasri, *Human Values and Professional Ethics*, Maruthi Publications.
2. S B George, *Human Values and Professional Ethics,* Vikas Publishing.
3. KR Govindan & Saenthil Kumar:Professional *Ethics and Human Values*, Anuradha Publications.
4. S K Chakraborthy & D.Chakraborthy: *Human Values and Ethics*, Himalaya.
5. M. Govindarajan, S. Natarajan, & V.S. Senthilkumar: *Engineering Ethics(Includes Human Values),* HI Learning Pvt. Ltd., New Delhi – 110001

II Year B. Tech. ME II-Sem

L	T	P	C
4	1	0	4

Fluid Mechanics & Hydraulic Machinery (ME0421)

Pre-requisites: None

Course Outcomes:
Understand the basic static, kinematic and dynamic principles and conservation laws to fluid flow problems in engineering applications. Design experimental procedure for physical model studies. Design the working proportions of hydraulic machines. Compute drag and lift coefficients using the theory of boundary layer flows. Analyze of free surface and pipe flows. Formulate and solve one dimensional compressible fluid flow problems. Study of different types of pumps and turbines.

UNIT I
Fluid Statics: Dimensions and Units: physical properties of fluids-specific gravity, viscosity, surface tension- vapour pressure and their influence on fluid motion-atmospheric, gauge and vaccum pressure- measurement of pressure- piezometer, U-Tube and Differential Manometers.

UNIT II
Fluid kinematics: stream line, path line and steak line and stream line, classification of flows steady & un steady, uniform & non uniform, laminar & turbulent, rotational & irrotational flows-equation of continuity for one dimensional flow and three dimensional flow.

Fluid dynamics: Surface & body forces Euler's & Bernouli's equations for flow along a stream line, moment equation and its applications on force on pipe bend. Measurement of flow: pitot tube, venture meter and orifice meter, flow nozzle.

UNIT III
Closed conduit flow: Reynold's experiment-Darcy Weisbach equation-minor losses in pipes-pipes in series and pipes in parallel-total energy line-hydraulic gradient line.
Boundary layer concepts: Definition, thicknesses, characteristics along thin plate, laminar and turbulent boundary layers (No derivations) boundary layer in transition, separation of boundary layers submerged objects-drag and lift .

UNIT IV

Basics and hydraulic turbine turbo machinery: Hydro dynamic force on jets on stationary and moving plate, inclined, and curved vanes, jet striking centrally and at tip, velocity diagrams, work done and efficiency , flow over radial vanes.

Classification of turbines, heads and efficiencies, impulse and reaction turbines, Pelton wheel, Francis turbine, and Kaplan turbine-working proportions, work done, efficiencies, hydraulic design-draft tube theory-functions and efficiency.

UNIT V

Performance of hydraulic turbines and pumps: Geometric similarity, unit and specific quantities, characteristic curves, governing of turbines, selection of type of turbines, cavitation, surge tank, water hammer.

Centrifugal pumps: Classification, working, work done-barometric head-losses and efficiencies specific speed-performance characteristic curves, NPSH.

Reciprocating pumps: Working, discharge, slip, indicator diagrams.

TEXT BOOKS:

1. Hydraulics, Fluid mechanics and hydraulic machinery by MODI and SETH
2. Fluid mechanics and hydraulic machines by Rajput

REFERENCES:

1. Fluid mechanics and fluid power engineering by D.S.Kunar, Kotaria and sons.
2. Fluid mechanics and machinery by D. Rama Durgaiah, New age international.
3. Hydraulic machines by Banga and Sharma, Khanna publishers

II Year B. Tech. ME II-Sem

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THERMAL ENGINEERING –I (ME0422)

Pre-requisite: Thermodynamics

Course Objective:

To apply the laws of Thermodynamics to analyse air standard cycles and to understand and evaluate the perform analysis of the major components and systems of IC engines, refrigeration cycles and their applications.

Course Outcomes:

At the end of the course, the student should be able to Evaluate the performance of IC engines and compressors under the given operating conditions.Apply the laws of Thermodynamics to evaluate the performance of Refrigeration and air-conditioning cycles.Understand the functionality of the major components of the IC Engines and effects of operating conditions on their performance

UNIT – I

I.C. Engines:

Classification - Working principles of Four & Two stroke engine, SI & CI engines, Valve and Port Timing Diagrams, Air – Standard, air-fuel and actual cycles - Engine systems – Carburetor and Fuel Injection Systems for SI engines, Fuel injection systems for CI engines, Ignition, Cooling and Lubrication system, Fuel properties and Combustion Stoichiometry.

UNIT – II

Normal Combustion and abnormal combustion in SI engines – Importance of flame speed and effect of engine variables – Abnormal combustion, pre-ignition and knocking in SI Engines – Fuel requirements and fuel rating, anti knock additives – combustion chamber – requirements, types of SI engines.

Four stages of combustion in CI engines – Delay period and its importance – Effect of engine variables – Diesel Knock– Need for air movement, suction, compression and combustion induced turbulence in Diesel engine – open and divided combustion chambers and fuel injection– Diesel fuel requirements and fuel rating

UNIT III

Testing and Performance:

Parameters of performance - measurement of cylinder pressure, fuel consumption, air intake, exhaust gas composition, Brake power – Determination of frictional losses and indicated power – Performance test – Heat balance sheet and chart

Classification of compressors – Fans, blowers and compressors – positive displacement and dynamic types – reciprocating and rotary types.

Reciprocating Compressors: Principle of operation, work required, Isothermal efficiency volumetric efficiency and effect of clearance volume, staged compression, under cooling, saving of work, minimum work condition for staged compression

UNIT – IV

Rotary Compressor(Positive displacement type): Roots Blower, vane sealed compressor, Lysholm compressor – mechanical details and principle of working – efficiency considerations.

Dynamic Compressors: Centrifugal compressors: Mechanical details and principle of operation – velocity and pressure variation. Energy transfer-impeller blade shape-losses, slip factor, power input factor, pressure coefficient and adiabatic coefficient – velocity diagrams – power.

Axial Flow Compressors: Mechanical details and principle of operation – velocity triangles and energy transfer per stage degree of reaction, work done factor - isentropic efficiency- pressure rise calculations – Polytropic efficiency.

UNIT – V

REFRIGERATION : Mechanical Refrigeration and types – units of refrigeration – Air Refrigeration system, details and principle of operation – applications of air refrigeration, Vapour compression refrigeration systems – calculation of COP – effect of superheating and sub cooling, desired properties of refrigerants and common refrigerants- Vapour absorption system – mechanical details – working principle, Use of p-h charts for calculations

Air-Conditioning: Concepts of Psychrometry – Properties of moist air – Usage of Psychrometric Chart – Calculation of moist air properties.

Types of air –conditioning systems – Requirements –– schematic layout of a typical plant.

TEXT BOOKS:

1. I.C. Engines / V. Ganesan- TMH
2. Thermal Engineering / Rajput / Lakshmi Publications.
3. Thermal Engineering / P.K.Nag

REFERENCE BOOKS:

1. IC Engines – Mathur & Sharma – Dhanpath Rai & Sons.
2. Engineering fundamentals of IC Engines – Pulkrabek / Pearson /PHI
3. Thermal Engineering / Rudramoorthy - TMH
4. Thermodynamics & Heat Engines / B. Yadav/ Central Book Depot., Allahabad
5. I.C. Engines / Heywood /McGrawHIll.
6. Thermal Engineering – R.S. Khurmi & J.K.Gupta – S.Chand

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Dynamics of Machines (ME0423)

Pre-requisite: Kinematics of machines

Course Outcomes:
At the end of course the student is able to design various machine members like shafts, bearings, gears, belts & chains and various I.C. Engine Components & Machine tool parts.

UNIT – I

Precession: Gyroscopes – effect of precession – motion on the stability of moving vehicles such as motorcycle – motorcar – aeroplanes and ships.

Static and Dynamic Force Analysis: Static force analysis of planar mechanisms – Analytical Method – Dynamic Force Analysis – D'Alembert's principle, Dynamic Analysis of 4-link mechanism, Slider Crank Mechanism.

UNIT – II

Turning Moment Diagram And Flywheels: Engine Force Analysis – Piston Effort, Crank Effort, etc., Inertia Force in Reciprocating Engine – Graphical Method - Turning moment diagram –fluctuation of energy – flywheels and their design - Inertia of connecting rod- inertia force in reciprocating engines – crank effort and torque diagrams.-.

UNIT – III

Friction: pivots and collars – uniform pressure, uniform wear – friction circle and friction axis: lubricated surfaces – boundary friction – film lubrication. Clutches – Types – Single plate, multi-plate and cone clutches.

Brakes And Dynamometers: Types of brakes: Simple block brake, band and block brake-internal expanding shoe brake-effect of braking of a vehicle. Dynamometers – absorption and transmission types. General description and methods of operation.

UNIT – IV

Governors: Types of governors - Watt, Porter and Proell governors. Spring loaded governors – Hartnell and Hartung with auxiliary springs. Sensitiveness, isochronisms and hunting **–** stability – effort and power of the governors.

Balancing : Balancing of rotating masses- Primary, Secondary, and higher balancing of reciprocating masses. Analytical and graphical methods. Unbalanced forces and couples.

Examination of “V” and multi cylinder in-line and radial engines for primary and secondary balancing- locomotive balancing – Hammer blow – Swaying couple – variation of tractive effort.

UNIT – V

Vibrations: Free Vibration of mass attached to vertical spring – Transverse loads – vibrations of beams with concentrated and distributed loads. Dunkerly’s method – Raleigh’s method. Whirling of shafts – critical speed – torsional vibrations – one, two and three rotor systems.

TEXT BOOKS:

1. Theory of Machines, S.S.Rattan.
2. Theory of Machines, R.S.Khurmi

REFERENCE BOOKS:

1. Theory of Machines, Shigley, Mc Graw Hill Publishers
2. Theory of Machines, Thomas Bevan, CBS Publishers
3. Theory of Machines, R.K.Bansal (Lakshmi publications)
4. Mechanism and Machine Theory, JS Rao and RV Duggipati, New Age

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Production Technology (ME0424)

Pre-requisites: Basic Mechanical Engineering

Course Outcomes:
Understand the idea for selecting materials for patterns. Types and allowances of patterns used in casting and analyze the components of moulds. Design core, core print and gating system in metal casting processes Understand arc, gas, solid state and resistance welding processes. Develop process-maps for metal forming processes using plasticity principles.Identify the effect of process variables to manufacture defect free products.

UNIT – I

Casting : Steps involved in making a casting – Advantage of casting and its applications; Patterns - Pattern making, Types, Materials used for patterns, pattern allowances and their construction; Properties of moulding sands.
Methods of Melting - Crucible melting and cupola operation – Defects in castings;
Casting processes – Types – Sand moulding, Centrifugal casting, die- casting, Investment casting, shell moulding; Principles of Gating – Requirements – Types of gates, Design of gating systems – Riser – Function, types of Riser and Riser design.
Solidification of casting – Solidification of pure metal – Nucleation and grain growth, casting design considerations

UNIT – II

Welding: Classification – Types of welds and welded joints; Gas welding - Types, oxy-fuel gas cutting – standard time and cost calculations. Arc welding, forge welding, submerged arc welding, Resistance welding, Thermit welding.

UNIT – III

Inert Gas Welding _ TIG Welding, MIG welding, Friction welding, induction welding, explosive welding, Laser Welding; Soldering and Brazing; Heat affected zone in welding. Welding defects – causes and remedies; destructive and non- destructive testing of welds.

UNIT – IV

Hot working, cold working, strain hardening, recovery, recrystallisation and grain growth. Rolling fundamentals – theory of rolling, types of Rolling mills and products. Forces in rolling and power requirements
Stamping, forming and other cold working processes. Blanking and piercing – Bending and forming – Drawing and its types – wire drawing and Tube drawing – coining – Hot and cold spinning.

Types of presses and press tools. Forces and power requirement in the above operations.

UNIT – V

Extrusion of Metals : Basic extrusion process and its characteristics. Hot extrusion and cold extrusion - Forward extrusion and backward extrusion – Impact extrusion – Extruding equipment – Tube extrusion and pipe making, Hydrostatic extrusion. Forces in extrusion

Forging Processes : Forging operations and principles – Tools – Forging methods – Smith forging, Drop Forging – Roll forging – Forging hammers : Rotary forging – forging defects – cold forging, swaging, Forces in forging operations.

TEXT BOOKS :

1. Manufacturing Technology / P.N. Rao/TMH

REFERENCE BOOKS :

1. Production Technology / R.K. Jain
2. Metal Casting / T.V Ramana Rao / New Age
3. Principles of Metal Castings / Rosenthal.
4. Welding Process / Parmar /
5. Production Technology /Sarma P C /
6. Manufacturing Engineering and Technology/Kalpakjin S/ Pearson Edu.

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Instrumentation & Control Systems (ME0425)

Prerequisite: Mathematics-I, Thermodynamics, Basic of Electrical and electronic Engineering.

Course Objectives: Understanding the basic characteristic of a typical instrument. Identifying errors and their types that would occur in a instrument. Identifying properties used for evaluating the thermal systems. The concept of transducer and Various types and their characters.

Course Outcome: To identify various elements and their purpose in typical instruments, to identify various errors that would occur in instruments. Analysis of errors so as to determine correction factors for each an instrument. To understand static and dynamic characteristics of instrument and should be able to determine loading response time. For given range of displacement should be able to specify transducer, it accurate and loading time of that transducer.

UNIT – I

Definition – Basic principles of measurement – Measurement systems, generalized configuration and functional description of measuring instruments – examples. Static and Dynamic performance characteristics – sources of errors, Classification and elimination of errors.

Measurement of Displacement: Theory and construction of various transducers to measure displacement – Piezo electric, Inductive, capacitance, resistance, ionization and Photo electric transducers, Calibration procedures.

UNIT – II

Measurement of Temperature: Various Principles of measurement-Classification: Expansion Type: Bimetallic Strip- Liquid in glass Thermometer; Electrical Resistance Type: Thermistor, Thermocouple, RTD; Radiation Pyrometry: Optical Pyrometer; Changes in Chemical Phase: Fusible Indicators and Liquid crystals.

Measurement of Pressure: Different principles used- Classification: Manometers, Dead weight pressure gauge. Tester (Piston gauge), Bourdon pressure gauges, Bulk modulus pressure gauges Bellows – Diaphragm gauges. Low pressure measurement – Thermal conductivity gauges, ionization pressure gauges, Mcleod pressure gauge.

UNIT – III

Measurement of Level: Direct methods – Indirect methods – Capacitive, Radioactive, Ultrasonic, Magnetic, Cryogenic Fuel level indicators – Bubbler level indicators.

Flow measurement: Rotameter, magnetic, Ultrasonic, Turbine flow meter, Hot – wire anemometer, Laser Doppler Anemometer (LDA).

Measurement of Speed : Mechanical Tachometers, Electrical tachometers, Non-contact type-Stroboscope

Measurement of Acceleration and Vibration : Different simple instruments – Principles of Seismic instruments – Vibrometer and accelerometer using this principle-Piezo electric accelerometer.

UNIT – IV

Stress-Strain measurements : Various types of stress and strain measurements – Selection and installation of metallic strain gauges- electrical strain gauge – gauge factor – method of usage of resistance strain gauge for bending compressive and tensile strains – Temperature compensation techniques, Use of strain gauges for measuring torque, Strain gauge Rosettes.

Measurement of Humidity: Moisture content of gases, Sling Psychrometer, Absorption Psychrometer, Dew point meter.

Measurement of Force, Torque and Power- Elastic force meters, load cells, Torsion meters, Dynamometers.

UNIT – V

Elements of Control Systems:

Introduction, Importance – Classification – Open and closed systems-Servomechanisms – Examples with block diagrams – Temperature, speed and position control systems- Transfer functions- First and Second order mechanical systems

TEXT BOOKS:

1. Principles of Industrial Instrumentation & Control Systems, Alavala, Cengage Learning
2. Instrumentation, Measurement & Analysis, B.C.Nakra & K.K.Choudhary, TMH
3. Mechanical Measurements & Controls by D.S. Kumar

REFERENCE BOOKS:

1. Measurement Systems: Applications & design, E.O.Doebelin, TMH
2. Experimental Methods for Engineers / Holman
3. Mechanical and Industrial Measurements / R.K. Jain/ Khanna Publishers.
4. Mechanical Measurements / Sirohi and Radhakrishna / New Age International.

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(GN0491): GENDER SENSITIZATION LAB
(An Activity-based Course)

Objectives of the Course:

- To develop students' sensibility with regard to issues of gender in contemporary India.
- To provide a critical perspective on the socialization of men and women.
- To introduce students to information about some key biological aspects of genders.
- To expose the students to debates on the politics and economics of work.
- To help students reflect critically on gender violence.
- To expose students to more egalitarian interactions between men and women.

Learning Outcomes:

- Students will have developed a better understanding of important issues related to gender in contemporary India.
- Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film.
- Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
- Students will acquire insight into the gendered division of labour and its relation to politics and economics.
- Men and women students and professionals will be better equipped to work and live together as equals.
- Students will develop a sense of appreciation of women in all walks of life.
- Through providing accounts of studies and movements as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender violence.

Unit-I: UNDERSTANDING GENDER

- **Gender: Why Should We Study It? (*Towards a World of Equals*: Unit -1)**
- **Socialization: Making Women, Making Men(*Towards a World of Equals*:Unit -2)**
- Introduction. Preparing for Womanhood. Growing up Male. First lessons in Caste. Different Masculinities.

Unit – II: GENDER AND BIOLOGY

- **Missing Women: Sex Selection and Its Consequences (*Towards a World of Equals*: Unit -4)**
- Declining Sex Ratio. Demographic Consequences.
- **Gender Spectrum: Beyond the Binary (*Towards a World of Equals*: Unit -10)**
- Two or Many? Struggles with Discrimination.

Unit – III: GENDER AND LABOUR

- **Housework: the Invisible Labour (*Towards a World of Equals*: Unit -3)**
- "My Mother doesn't Work." "Share the Load."
- **Women's Work: Its Politics and Economics(*Towards a World of Equals*:Unit -7)** Fact and Fiction. Unrecognized and Unaccounted work. Additional Reading: Wages and Conditions of Work.

Unit – IV: ISSUES OF VIOLENCE

- **Sexual Harassment: Say No! (*Towards a World of Equals*: Unit -6)**
- Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: "*Chupulu".*
- **Domestic Violence: Speaking Out (*Towards a World of Equals*: Unit -8)**
- Is Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Additional Reading: New Forums for Justice.
- **Thinking about Sexual Violence (*Towards a World of Equals*: Unit -11)**
- Blaming the Victim-"I Fought for my Life…." - Additional Reading: The Caste Face of Violence.

Unit – V: GENDER : CO-EXISTENCE

- **Just Relationships: Being Together as Equals (*Towards a World of Equals*: Unit -12)**
- Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Additional Reading: Rosa Parks-The Brave Heart.

Essential Reading: All the Units in the Textbook, "*Towards a World of Equals: A Bilingual Textbook on Gender"* written by A.Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu.

Note: Since it is Interdisciplinary Course, Resource Persons can be drawn from the fields of English Literature or Sociology or Political Science or any other qualified faculty who has expertise in this field from engineering departments.

Reference Books:

1. Sen, Amartya. "More than One Million Women are Missing." New York Review of Books 37.20 (20 December 1990). Print. '*We Were Making History…' Life Stories of Women in the Telangana People's Struggle*. New Delhi: Kali for Women, 1989.

2. Tripti Lahiri. “By the Numbers: Where Indian Women Work.” *Women’s Studies Journal* (14 November 2012) Available online at: http:// blogs.wsj.com/ India real time/2012/11/14/by –the-numbers-where-Indan-women-work/>
3. K. Satyanarayana and Susie Tharu (Ed.) Steel Nibs Are Sprouting: New Dalit Writing From South India, Dossier 2: Telugu And Kannada http://harpercollins.co.in/BookDetail.asp?Book_Code=3732
4. Vimala. “Vantillu (The Kitchen)*”. Women Writing in India: 600 BC to the Present. Volume II*: The 20th Century. Ed. Susie Tharu and K. Lalita. Delhi: Oxford University Press, 1995. 599-601.
5. Shatrughna, Veena et al. *Women’s Work and its Impact on Child Health and Nutrition*, Hyderabad, National Institute of Nutrition, Indian Council of Medical Research. 1993.
6. Stree Shakti Sanghatana*. “We Were Making History ….’ Life Stories of Women in the Telangana People’s Struggle*. New Delhi: Kali for Women, 1989.
7. Menon, Nivedita. Seeing like a Feminist. New Delhi: Zubaan-Penguin Books, 2012
8. Jayaprabha, A. “Chupulu (Stares)”. *Women Writing in India: 600BC to the Present. Volume II*: The 20th Century Ed. Susie Tharu and K. Lalita. Delhi: Oxford University Press, 1995. 596-597.
9. Javeed, Shayan and Anupam Manuhaar. “Women and Wage Discrimination in India: A Critical Analysis.” *International Journal of Humanities and Social Science Invention* 2.4(2013)
10. Gautam, Liela and Gita Ramaswamy. “A ‘conversation’ between a Daughter and a Mother.” *Broadsheet on Contemporary Politics*. Special Issue on *Sexuality and Harassment: Gender Politics on Campus Today*. Ed. Madhumeeta Sinha and Asma Rasheed. Hyderabad: Anveshi Research Center for Women’s Studies, 2014.
11. Abdulali Sohaila. “*I Fought For My Life…and Won*.”Available online at: http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal/
12. Jeganathan Pradeep, Partha Chatterjee (Ed). “*Community, Gender and Violence Subaltern Studies XI*”. Permanent Black and Ravi Dayal Publishers, New Delhi, 2000
13. K. Kapadia. The *Violence of Development: The Politics of Identity, Gender and Social Inequalities in India.* London: Zed Books, 2002
14. S. Benhabib. *Situating the Self: Gender, Community, and Postmodernism in Contemporary Ethics,* London: Routledge, 1992
15. Virginia Woolf. *A Room of One’s Own.* Oxford: Black Swan. 1992.
16. T. Banuri and M. Mahmood, *Just Development: Beyond Adjustment with a Human Face,* Karachi: Oxford University Press, 1997/

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Fluid Mechanics & Hydraulic Machinery Lab (ME0426)

Pre-requisites: None

Course Outcomes:
Develop procedure for standardization of experiments. Calibrate flow discharge measuring device used in pipes channels and tanks. Determine fluid and flow properties. Characterize laminar and turbulent flows. Compute drag coefficients. Test the performance of pumps and turbines.

1. Calibration of Venturimeter & Orifice meter
2. Determination of Coefficient of discharge for a small orifice by a constant head method.
3. Determination of Coefficient of discharge for an external mouth piece by variable head method.
4. Calibration of contracted Rectangular Notch and /or Triangular Notch
5. Determination of Coefficient of loss of head in a sudden contraction and friction factor.
6. Verification of Bernoulli's equation.
7. Performance test on single stage centrifugal pump
8. Performance test on reciprocating pump
9. Impact of jet on vanes
10. Performance and Specific speed test on Pelton wheel (or Turbo Wheel)
11. Performance and specific speed test on Francis Turbine
12. Performance and specific speed test on Kaplan Turbine
13. Performance test on multi stage pump
14. Suitability test on centrifugal pump
15. Drag and Lift Coefficients of an Aerofoil model.

Any ten of the above experiments are to be covered.

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Instrumentation & control system Lab (ME0427)

Pre-requisites: Basic principles of Instrumentation and control systems

Course Outcomes: At the end of the course, the student will be able to Characterize and calibrate measuring devices. Identify and analyze errors in measurement. Analyze measured data using regression analysis. Calibration of Pressure Gauges, temperature, LVDT, capacitive transducer, rotameter.

1. Calibration of transducer for temperature measurement.
2. Study and calibration of LVDT transducer for displacement measurement.
3. Calibration of strain gauge for temperature measurement.
4. Calibration of thermocouple for temperature measurement.
5. Calibration of capacitive transducer for angular displacement.
6. Study and calibration of photo and magnetic speed pickups for the measurement of speed.
7. Calibration of resistance temperature detector for temperature measurement.
8. Study and calibration of a rotometer for flow measurement.
9. Study and use of a Seismic pickup for the measurement of vibration amplitude of an engine bed at various loads.
10. Study and calibration of McLeod gauge for low pressure.

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Production Technology Lab (ME0428)

Pre-requisites: Manufacturing Technology

Course Outcomes:
Understanding the properties of moulding sands and pattern making.Fabricate joints using gas welding and arc welding. Evaluate the quality of welded joints. Basic idea of press working tools and perform moulding studies on plastics.

Metals Casting Lab:

1. Moulding - 2 Exercises
2. Melting & Casting - Demonstration
3. Pattern Marking - - 1 Exercise

Welding Lab:
1) Arc Welding:
a) Effect of polarity on welds strength & Heat affected zone
b) Effect of current on weld strength and Heat affected zone

2) Spot Welding – Effect of current on weld strength.

3) Gas welding and brazing exercises.

Mechanical Press Working:
1) Blanking & Piercing operation & Study of simple Compound and progressive press tools.
2) Hydraulic Press: Deep Drawing and Extrusion Operations.
3) Bending and other operations.

Processing of Plastics:

1) Injection Moulding
2) Blow Moulding