B.Tech. II Year -I Sem   **L T/P/D C**

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(19BS2112) Probability and Statistics & Complex variables

Pre-requisites: Mathematical Knowledge at pre-university level
Course Objectives: To learn
- The ideas of probability and random variables and various discrete and continuous probability distributions and their properties.
- The basic ideas of statistics including measures of central tendency, correlation and regression.
- The statistical methods of studying data samples.
- Differentiation and integration of complex valued functions.
- Evaluation of integrals using Cauchy"s integral formula and Cauchy"s residue theorem.
- Expansion of complex functions using Taylor"s and Laurent"s series.

Course outcomes: After learning the contents of this paper the student must be able to
- Formulate and solve problems involving random variables and apply statistical methods for analysing experimental data.
- Analyse the complex function with reference to their analyticity, integration using Cauchy"s integral and residue theorems.
- Taylor"s and Laurent"s series expansions of complex function.

UNIT - I: Basic Probability

Probability spaces, conditional probability, independent events, and Bayes" theorem. Random variables: Discrete and continuous random variables, Expectation of Random Variables, Moments, Variance of random variables

UNIT - II: Probability distributions

Binomial, Poisson, evaluation of statistical parameters for these distributions, Poisson approximation to the binomial distribution. Continuous random variables and their properties, distribution functions and density functions, Normal and exponential, evaluation of statistical parameters for these distributions

UNIT - III: Testing of Hypothesis

Test of significance: Basic of testing of Hypothesis. Null and alternate Hypothesis, types of errors, level of significance, critical region.Large sample test for single proportion, difference of proportions, single mean, difference of means; small sample tests: Test for single mean, difference of means and test for ratio of variances

UNIT - IV: Complex Variables (Differentiation)

      Limit, Continuity and Differentiation of Complex functions, Analyticity, Cauchy-Riemann equations (without proof), finding harmonic conjugate; elementary analytic functions (exponential, trigonometric, logarithm) and their properties.

UNIT - V: Complex Variables (Integration)

      Line integral, Cauchy"s theorem, Cauchy"s Integral formula, Zeros of analytic functions, Singularities, Taylor"s series, Laurent"s series; Residues, Cauchy Residue theorem.

Text books:
1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2010.
2. Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, keying Ye, Probability and statistics for engineers and scientists, 9th Edition, Pearson Publications.
3. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Ed., Mc-Graw Hill, 2004.

Reference Books:
1. Fundamentals of Mathematical Statistics, Khanna Publications, S. C. Gupta and V. K. Kapoor.
2. Miller and Freund"s, Probability and Statistics for Engineers, 8th Edition, Pearson Educations
3. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.
4. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
5. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.

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(19ME2111) THERMODYNAMICS

Pre-requisite: Engineering Chemistry and Physics

Course Objectives:

1. To teach students the basic principles of classical thermodynamics and prepare them to apply basic conversion principles of mass and energy to closed and open systems.
2. To enable the students to understand second law of thermodynamics and apply it to various systems, note the significance of the results and to know about availability, entropy and second law aspects of daily life.
3. To teach students about properties of pure substances and Using of mollier charts.
4. To help the students understand various gas laws and equations of state and apply them to solve problems of gas mixtures in estimating enthalpy, entropy, specific heat and internal energy.

Course Outcomes: Student will be able to

1. Demonstrate an understanding of the concepts such as conservation of mass, conservation of energy, work interaction, heat transfer and first law of thermodynamics.
2. Identify closed and open systems and analyze related problems.
3. Apply the concept of second law to design simple systems.
4. Demonstrate the importance of phase change diagrams of various pure substances.
5. Apply gas laws to mixtures.

UNIT I

        Basic concepts of Thermodynamics: Introduction, System, Surroundings, universe, macroscopic and microscopic views, property, Path and Point functions, temperature and International Temperature Scale, Zeroth law of thermodynamics and application, Thermodynamics state and equilibrium, process and cycle, work, heat and other forms of energy.

        FIRST LAW OF THERMODYNAMICS: First law of thermodynamics, applications to closed and open systems, uniform and non uniform processes, steady state and unsteady state processes, general energy equation and applications to thermal equipment.

UNIT II

        Second Law Of Thermodynamics: Kelvin-Planck and Clausius statements-heat engines and heat pump, reversibility, Carnot cycle, Carnot theorem, Thermodynamic temperature scale, Deduction of the third law of thermodynamics ,Types of Irreversibility.

UNIT III

        Entropy & Available Energy, Availability And Irreversibility: Clausius theorem, Property of Entropy, Clausius inequality, Entropy Principle, Applications of entropy principle, Maximum work obtainable from finite heat reservoirs, Entropy Generation in Closed and Open Systems, Isentropic Work in a Steady Flow Open System. Availability Basics, Available energy

referred to a cycle, Maximum work in a reversible process, Reversible work-open cycle and closed system, Availability and Irreversibility.

UNIT IV

Properties Of Pure Substances, Ideal Gases And Properties Of Steam: Ideal gas equation, Properties of Ideal Gases, Equations of State, Law of Corresponding States, Properties of Mixtures, compressibility, universal compressibility chart, Pure Substances, P-V-T Surfaces, P-V, T-V, and P-T diagrams of water and other substances and differences of the same, phase change processes, Concept of Vapor Pressure, Properties of steam, Saturation Temperature and Pressure, Use of property tables, T-S diagrams, Mollier Chart, Rankine Cycle.

UNIT V

Thermodynamic Relations: Thermodynamic Relations, Maxwell‚s Equations, Gibbs and Helmholtz Functions, Joule Kelvin Effect, Clausius-Clapeyron Equation, Conditions of Thermodynamic Equilibrium and Stability.

Text books:
1. P K Nag, 6th Edition, BasicEngineering Thermodynamics, Tata McGraw-Hill Publishing Company Ltd.
2. Yunus A. Cengel Michael A. Boles, (2005), Thermodynamics: An Engineering Approach, McGraw-Hill Science.
3. Engineering Thermodynamics – R.K. Rajput Laxmi Publications 3rd Edition..
4. A Text Book of Engineering Thermodynamics - BB Ghosh, Sanis. Ghosh / Vikas.
5. Applications of Thermodynamics – V. Kadambi / Wiles

Reference Books:
1. Cengel Y Al and Boles M A "Thermodynamics, An Engineering Approach‖ Tata McGraw Hill, 2003.
2. Michael J Moran, ―Fundamentals of Engineering Thermodynamics‖, Wiley India Pvt. Ltd., 2010.
3. Holman J P, ―Thermodynamics‖, Tata McGraw Hill, 1998.
4. Thermodynamics / S.C.Gupta / Pearson
5. Applied Thermodynamics for Engineering Technologist – Y.D. Estop / Pearson 5th Edition.

B.Tech. II Year- I Sem   **L T/P/D   C**
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(19ME2112) KINEMATICS OF MACHINERY

Pre-requisites: Basic principles of mechanics.

Course Objectives:
1. Understand mechanisms for motion transmission.
2. Understand the construction methods for drawing velocity and acceleration diagrams.
3. Design engineering applications involved in selection, sizing of mechanism to accomplish motion objectives.
4. Understand the mechanism involving cams, gears and gear trains.
5. Analysis of gear trains.

Course Outcomes:
After completion of course the student is able to:
1. Draw velocity and acceleration diagrams of various parts of a machine along with the transmission mechanisms.
2. Design components of machine parts, structures, gears, cams, belts, pulleys, etc. for kinematic analysis.
3. Understand the straight line motion mechanisms, Hooke's joint and steering mechanisms.
4. Design the mechanisms after analysis for safety and efficient working.

UNIT – I
   Simple Mechanisms : Elements or Links, types of links, 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 constrained and incompletely constrained . Kinematics chain, inversion of mechanism, type of kinematic chains, four bar or quadric cycle chain, single and double slider crank chains and their inversions.

UNIT – II
   Plane motion of body: Instantaneous center of rotation, centrodes and axodes, relative motion between two bodies. Three centers in line theorem – Graphical determination of instantaneous center, analysis of simple mechanisms and determination of linear velocity and angular velocity of links.
   Kinematics: Velocity and acceleration – Motion of link in machine – construction of Velocity and acceleration – Graphical method – Application of relative velocity method- four bar chain.
   Analysis of Mechanisms: Analysis of slider crank chain for displacement, velocity and acceleration of slider – Acceleration diagram for a given mechanism. Kliens construction , Coriolis acceleration , determination of Coriolis component of acceleration

UNIT – III

    Hooke's Joint: Hooke"s joint –universal coupling – application – problems.

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

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. Maximum velocity and maximum acceleration during outward and return strokes in the above three cases. Over view of polynomial motions. Analysis of motion of followers: Roller follower – circular arc cam with straight, concave and convex flanks.

UNIT – V

    Gears-Gear trains: 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, Path of contact.

    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. Expressions for arc of contact.

Text books:

1. S.S.Rattan, Theory of Machines, 3rdedition, McGraw-Hill Publications, New Delhi (2011).
2. Amitabha Ghosh and Ashok Kumar Mallik, Theory of Mechanisms and Machines, 3rd edition, East West Press Pvt. Ltd., New Delhi (Reprint 2017).
3. R.K. Bansal, J.S. Brar. A Textbook of Theory of Machines; L.P January 2016.
4. Shigley J. E. and John Joseph Uicker, Theory of Machines and Mechanisms, 2ndedition McGraw-Hill international edition (2003)
5. Norton, R.L., Design of Machinery - An introduction to Synthesis and Analysis of Mechanisms and Machines, McGraw Hill International Editions, New York, Edition II, 2000.

Reference Books:

1. Thomas Bevan, "Theory of Machines", College Book Store (CBS) Publishers Ltd., 3rd Edn., 1985.
2. Theory of Machines and Mechanisms Prof. PL BALLANEY; Kanna Publications 25 edition.
3. J.S. Rao and R.V. Dukkipati, "Mechanisms and Machine Theory", Wiley Eastern Limited, 1992.
4. " Theory of Machines: Kinematics and Dynamics" by Sadhu Singh. Pearson, 3rd Edition.
5. Theory of Machines by RS Kurmi & JK Gupta; S CHAND New Addition.

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(19ME2113) INDUSTRIAL METALLURGY AND MATERIAL SCIENCE

Pre-requisites: Maths, Physics and Chemistry

Course Objectives:
- Understandthe microstructures of different types of metal and alloys –cast iron, steels, non- ferrous metal and alloys.
- Understand the heat treatment principles-annealing, normalizing and hardening.
- Understand the different types of tool steels and non-ferrous alloys.
- Able to understand the importance of Titanium and its alloys.

Course Outcomes:
After completion of the course the student is able to:
- Distinguish different types of metals and alloys.
- Design a heat treatment process to change the properties-hardness, ductility, etc.
- Analyze the microstructures of various metals and alloys.
- Explain and justify the usage of Non-ferrous alloys specially Titanium and its alloys.

UNIT-I

Crystal Structures: Unit cells, Crystal systems, Crystallographic directions and planes, FCC, BCC and HCP structures, linear and planar densities, Close packed structures, Imperfections in crystal structures, Point defects, Dislocations, Grain boundaries, Grain size determination, Slip and deformation.

UNIT-II

Phase Diagrams And Phase Transformations: Phase, Gibbs phase rule, Microstructure, Binary phase diagrams, Isomorphous systems, Conditions of unlimited solubility, Eutectic systems, Intermediate phases, Eutectoid and peritectic reactions, Iron-Carbon diagram, Microstructures in Iron-Carbon alloys, Phase transformations, Isothermal transformation diagrams, Pearlite, Martensite and Bainite transformations, Tempered martensite, Continuous cooling transformation diagrams.

UNIT-III

Heat Treatment And Strengthening Methods: Heat treatment of steels, Annealing, Normalizing, Quench hardening, Tempering, Austempering, hardenability and hardenability test, Surface heat treatment / Case hardening, Carburising, Cyaniding, Nitriding, Flame hardening, Induction hardening, Strain hardening / Cold working and annealing, Three stages of annealing, Solid solution strengthening, Dispersion hardening, Precipitation / Age hardening, Strengthening

by grain refinement.

UNIT-IV
Steels And Cast Irons: Carbon steels and Low alloy steels, Effects of alloying elements, Important low alloy steels, Stainless steels, Ferritic, Martensitic and Austenitic stainless steels, Maraging steels, Tool steels, Types, Cast irons, White iron, Malleable iron, Grey iron, Ductile iron.

UNIT-V
Non Ferrous Metals, Ceramics And Composites: Copper and copper alloys, Brasses, Bronzes, Aluminum alloys, Temper designations for aluminium alloys, Heat treatable and non-heat treatable aluminium alloys, Nickel and Nickel alloys, Monel, Super alloys, Titanium and Titanium alloys, Alpha Ti alloys, Beta Ti alloys, Alpha-Beta Ti alloys, Nickel and nickel alloys, Ceramics, Glasses, Refractories, Types of refractories, Composites, Types of composites.

Text books:
1. Sydney H Avner, ―Introduction to Physical Metallurgy‖ McGraw Hill Book Company, 1997.
2. Raghavan V, ―Physical Metallurgy: Principles and Practice‖, Prentice-Hall of India Pvt.Ltd, 2006.
3. V.D. Kodgire, "Material Science and Metallurgy", Everest Publishing House - 25th Edition – 2009.
4. Metallurgy and Material Science – Pakirappa Durga publishing house Hyderabad.
5. Material Science for Engineers – J.C.Anderson Nelson Thomas U.K
6.Engineering Materials Technology – Bolton.W Heimann Newvers Oxford.
7.Engineering Physical Metallurgy – Laktin LIR Publications Moscow.

Reference Books:
1. William D CallisterJr, ―Materials Science and Engineering-An Introduction‖, John Wiley and Sons Inc., New York, 2009
2. Kenneth G. Budinski and Michael K. Budinski, ―Engineering Materials: Properties and Selection‖, Prentice Hall, 2010.
3. B.K.Agarwal, "Introduction to Engineering Materials", Tata McGraw Hill - 1 [st]Edition.
4. M.Mukhopadhyay, "Mechanics of Composite Materials and Structures" Universities Press - 2004.
5. Mechanics of Composite Materials – Tailor & Francis Publishing Co.
6. Material Science – I.P.Singh – Publisher Jain Brothers New Delhi
7. Ekements of Physical Metallurgy – A.G.Guy Oxford & IBH Publication Co. Calcutta

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(19ME2114) MECHANICS OF SOLIDS

Pre Requisite: Engineering Mechanics
Course Objectives:
1. This course will advance the students" development of the following broad capabilities:
2. Students will be able to understand basic concepts of stress, strain and their relations based on linear elasticity. Material behaviors due to different types of loading will be discussed.
3. Students will be able to understand and know how to calculate stresses and deformation of a bar due to an axial loading under uniform and non-uniform conditions.
4. Students will understand how to develop shear-moment diagrams of a beam and find the maximum moment/shear and their locations.
5. Students will understand how to calculate normal and shear stresses

Course Outcomes:
After completion of this course the students will be able to:
1. Model and analyze the behavior of structural and machine components subject to various loadings and support conditions based on principles of equilibrium and material constitutional relationships.
2. Understand and apply the concept of stress and strain to analyze and design structural members and machine parts under axial loads, shear load, bending moment and Torsional moment.
3. Solve practical problems through evaluating the relationship between stress and strain.
4. Analyse of composite bars and shafts and deflections and deformations of loaded flexural members.
5. Determine stresses in both thin and thick cylinders.

UNIT – I
Simple Stresses And Strains : Elasticity and plasticity – Types of stresses and strains- Hook"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 – II
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 cantilever, simply supported and

overhanging beams subjected to point loads, UDL, 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.

UNIT – III

Flexural Stresses: Theory of simple bending – Assumptions – Derivation of bending equation: $M/I=f/y=E/R$ Neutral axis – Determination of bending stresses – section modulus 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.

UNIT – IV

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 – V

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

Thick cylinders – lame"s equation – cylinders subjected to inside and outside pressures – compound cylinders.

Text books:
1. S. Ramamrutham, Strength of Materials, DhanpatRai& Sons, 1993.
2. Strength of Materials by SS Rattan, McGraw Hill; Third Edition.
3. B.C. Punmia, Strength of Materials, Laxmi Publishers, 2012.
4. Timoshenko and Gere, Mechanics of Materials, CBS Publishers, 2011.
5. E.P.Popov, Engineering Mechanics of Solids, PHI, 2009.

Reference Books :
1. R.K. Rajput, Strength of Materials, S. Chand & Co., 2003.
2. D.S. Prakash Rao, Strength of Materials - A Practical Approach, UniversitiesPress, 1999.
3. G.H. Ryder, Strength of Materials, Third Edition in SI units, MacmillanIndian Limited, Delhi, 2002.
4. S. B. Junarkar, Mechanics of Structures, Charotar Publishers, 2010.
5. Ferdinand P Beer et.al., Mechanics of Materials, Tata McGraw-Hill, 2004.

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(19ME2151) THERMODYNAMICS LAB

Pre-requisites: Basic Principles of Thermodynamics

Course Objective: To understand the fuels and lubricants properties.

List of Experiments:

1. Determination of Flash and Fire points of Liquid fuels/Lubricants using Abels Apparatus

2. Determination of Flash and Fire points of Liquid fuels/Lubricants using Pensky Martens Apparatus.

3. Carbon residue test on Liquid fuels.

4. Determination of Viscosity of Liquid lubricants and Fuels using Saybolt Viscometer.

5. Determination of Viscosity of Liquid lubricants and Fuels using Redwood Viscometer.

6. Determination of Viscosity of Liquid lubricants and Fuels using Engler Viscometer

7. Determination of Calorific value: of Gaseous fuels using Junkers Gas Calorimeter.

8. Determination of Calorific value: Solid/Liquid/ fuels using Bomb Calorimeter.

9. Determination Drop point and Penetration test on Grease.

10. Fractional distillation experiment as per ASTM standard.

11. Cloud and Pour point test on oils.

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(19ME2152) METALLURGY AND MATERIAL SCIENCE LABORATORY

Pre-requisites: Fundamental knowledge on metallurgy and material science

Course Objectives:

Students will be able to experimentally learn the microstructure, compositions and various mechanical properties of the metals and alloys.

Course Outcomes:

1. The Primary focus of the Metallurgy and Material science program is to provide undergraduates with a fundamental knowledge based associated materials properties, and their selection and application.

2. Upon graduation, students would have acquired and developed the necessary background and skills for successful careers in the materials-related industries.

3. Furthermore, after completing the program, the student should be well prepared for management positions in industry or continued education toward a graduate degree.

List of Experiments :

1. Preparation and study of the microstructure of steels.

2. Study of microstructures of cast irons.

3. Preparation and study of the microstructure of non -ferrous alloys.

4. Preparation and study of the microstructure of heat treated steels.

5. Hardenability of steels by Jomney end quench test.

6. To find out the hardness of various treated and untreated steels.

(19ME2153) MECHANICS OF SOLIDS LAB

Pre-requisites: Engineering Mechanics

Course Objectives:
1. Students will be able to understand basic concepts of stress, strain and their relations based on linear elasticity. Material behaviors due to different types of loading will be discussed.
2. Students will be able to understand and know how to calculate stresses and deformation of a bar due to an axial loading under uniform and non-uniform conditions.
3. Students will understand how to develop shear-moment diagrams of a beam and find the maximum moment/shear and their locations
4. Students will understand how to calculate normal and shear stresses on any cross-section of a beam.

Course Outcomes:
1. Analyze the behavior of the solid bodies subjected to various types of loading.
2. Apply knowledge of materials and structural elements to the analysis of simple structures.
3. Undertake problem identification, formulation and solution using a range of analytical methods
4. Analyze and interpret laboratory data relating to behavior of structures and the materials they are made of, and undertake associated laboratory work individually and in teams.
5. Expectation and capacity to undertake lifelong learning

LIST OF EXPERIMENTS:
1. To investigate the behavior of given specimen under a Tensile Test.
2. To conduct the compression test on the given test specimen.
3. To perform the Bending test on the given test specimen.
4. To find out the Brinell Hardness and Rockwell hardness of the given material.
5. To organize the Bending test of a Simply Supported Beam of steel and wooden specimen.
6. To organize the Bending test of a Cantilever Beam of steel and wooden specimen.
7. To determine the Stiffness of the Spring under Compressive loads.
8. To determine the Stiffness of the Spring under Tensile loads.
9. To conduct the Punch Shear test on the given rod
10. To organize the Charpy test on the given specimen

11. To organize the Izod Impact Test on the given specimen

NOTE: Perform any 10 experiments as mentioned above.

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(19MC0001) GENDER SENSITIZATION

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.

Reference Books :

- Menon, Nivedita. Seeing like a Feminist. New Delhi: Zubaan-Penguin Books, 2012

- 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/

(19ME2211) DYNAMICS OF MACHINES

Pre-requisite: Kinematics of machines
Course Objectives:
1. The objective is to introduce some of the components mainly used in IC Engines and make analysis of various forces involved.
2. Subjects deals with topics like inertia forces in slider crank mechanism, IC Engine components and the analysis like governors is introduced.
3. It also deals with balancing of rotating and reciprocating parts.
4. Studies are made about balancing of multi cylinder engines, Radial engines etc.
5. Study of primary and secondary forces are considered while balancing. Finally they are introduced to the topic of vibrations.
6. The study deals with linear, longitudinal, and torsional vibrations.
7. The idea is to introduce the concept of natural frequency and the importance of resonance and critical speeds.

Course Outcome: The study of KOM and DOM are necessary to have an idea while designing the various machine members like shafts, bearings, gears, belts and chains and various I.C. Engine Components and 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 – Rayleigh"s method. Whirling of shafts – critical speed – torsional vibrations – one, two and three rotor systems.

Text Books:
1. Theory of Machines /S.S. Rattan / Mc Graw Hill. - 5th Edition
2. Theory of Machines /Sadhu Singh/ Pearson- 3rd Edition
3. Theory of Machines and Mechanisms / P.L Ballaney / Khanna Publishers- Twenty
   Fifth Edition.
4. Theory of Mechanisms & Machines Amitabha Ghosh Asok Kumar Mallik / East
   West Press Pvt.ltd
5. Theory of Machines by J. S Rao / New Age International Publishers.
6. Mechanical Vibrations / S.S Rao – 5th Edition / PEASON

Reference Books:
1. The Theory of Machines / Thomas Bevan / CBS Publications- Third Edition
2. Theory of Machines and Mechanisms/ John J. Uicker. Jr -Gordon R. Pennock -Joseph
   E. Shigley / Oxford – Fourth edition
3. Theory of Mechanisms and Machines 1st Edition, Reprint by Jagdish Lal-Metropolitan
Book Company Pvt.Ltd
4. Fundamentals of Machine theory and Mechanisms / Springer Publisher / Alex Bataller
Torras, Juan Antonio Cabrera Carrillo, Francisco Ezquerro JuancAntonio Jesús Guerra
Fernández.

5. Mechanical Vibrations by Dr. V. P Singh / Dhanpat Rai and Co (P) Ltd.

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(19ME2212) FLUID MECHANICS AND HYDRAULIC MACHINERY

Course Objectives: The objectives of the course are to enable the student;
1. To understand the basic principles of fluid mechanics
2. To identify various types of flows
3. To understand boundary layer concepts and flow through pipes
4. To evaluate the performance of hydraulic turbines
5. To understand the functioning and characteristic curves of pumps

Course Outcomes: The outcomes of the course are the student able to
1. Explain the effect of fluid properties on a flow system.
2. Identify type of fluid flow patterns and describe continuity equation.
3. To analyze a variety of practical fluid flow and measuring devices and utilize fluid Mechanics principles in design.
4. To select and analyze an appropriate turbine with reference to given situation in power plants.
5. To estimate performance parameters of a given Centrifugal and Reciprocating pump.
6. Demonstrate boundary layer concepts.

UNIT I
Fluid statics : Dimensions and units: physical properties of fluids- specific gravity, viscosity surface tension- vapor pressure and their influence on fluid motion- atmospheric gauge and vacuum pressure – measurement of pressure- Piezometer, U-tube and differential manometers.

Fluid kinematics : Stream line, path line and streak lines and stream tube, classification of flows-steady & unsteady, uniform, non uniform, laminar, turbulent, rotational, irrotational one, two and three dimensional flow, equation of continuity for one dimensional flow.

UNIT II
Fluid dynamics : Surface and body forces –Euler‟s and Bernoulli‟s equations for flow along a stream line, momentum equation and its application on force on pipe bend.

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.

Measurement of flow: pitot tube, venturimeter, and orifice meter, Flow nozzle Boundary Layer theory.

UNIT III

Basics of turbo machinery : Hydrodynamic force of jets on stationary and moving flat, inclined, and curved vanes, jet striking centrally and at tip, velocity diagrams, work done and efficiency, flow over radial vanes, Layout of hydroelectric power plant.

Hydroelectric power stations: Elements of hydro electric power station-types-concept of pumped storage plants-storage requirements.

UNIT IV

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

Performance of hydraulic turbines: Geometric similarity, Unit and specific quantities, cavitation, surge tank, water hammer, Hydraulic Ram.

UNIT V

Centrifugal pumps : Classification, working principle, work done – manomertic head-losses and efficiencies, specific speed- pumps in series and parallel-performance characteristic curves, NPSH.

Reciprocating pumps : Working principle and workdone, Discharge, slip, indicator diagrams.

Text books :
1. Hydraulics, fluid mechanics and Hydraulic machinery MODI and SETH.
2. Fluid Mechanics and Hydraulic Machines by Rajput.
3. Fluid Mechanics and Hydraulic Machines by R.K.Bansal Lakshmi Publications.
4. Fluid Mechanics and Hydraulic Machines by R.S.Khurmi S.chand & Co. Ltd,
5. Fluid Mechanics and Hydraulic Machines by S.C.Gupta - PERSON Educations.

Reference Books:
1. Fluid Mechanics and Fluid Power Engineering by D.S. Kumar, Kotaria & Sons.
2. Fluid Mechanics and Machinery by D. Rama Durgaiah, New Age International.
3. Hydraulic Machines by Banga & Sharma, Khanna Publishers.
4..Hydraulic Machines Including Fluidics PB by Jagdish Lal Metropolitan Book Co. Pvt. Ltd. , 1994.
5. Industrial Pneumatic Control by Z.J.Lanksy – Marcel Dekker, Inc.

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(19ME2213) MANUFACTURING PROCESSES

Pre-requisites: Material science and metallurgy.

Course Objectives:
1. Understand about sand casting and metal casting techniques.
2. Impart the knowledge of various welding processes.
3. Understand about the importance rolling, forging and sheet metal operations.
4. Understand about the processing of plastics.

Course Outcomes:
After completion of the course the student is able to:
1. Analyze and select the suitable casting technique for making the components.
2. Analyze the different types of welding processes are needed for various materials and importance of welding.
3. Know the methods involved in sheet metal operations, rolling,forging etc.
4. Know the various manufacturing methods in processing of plastics.

UNIT-I
    Metal Casting Process: Patterns- Pattern materials, types of pattern, Pattern allowances-types of molding sand and its properties, mold sand composition- Core making**-**Methods of sand testing- gating and risering System- Melting Practices: cupola, Induction furnaces construction and operations- Casting cleaning and casting defects-Inspection methods. Special casting processes: Investment casting process, Die casting process, shell molding process-centrifugal casting process-CO2 Process.

UNIT-II
    Joining Processes: Fusion welding processes-Types of Gas Welding-Fuel Gases, Oxy-Acetylene Welding Equipment-Flame characteristics- Filler and Flux materials, Electric-Arc Welding, Electrodes, Coated electrode designation for manual metal arc welding, Carbon Arc Welding, Inert-Gas Shielded Arc Welding, Tungsten Inert-Gas Welding (TIG), Gas Metal-Arc Welding (GMAW), Submerged Arc-Welding (SAW), Other Arc-Welding Processes, Resistance Welding-Welding Defects. Basic principles of Thermit Welding, Laser Beam welding, Electron Beam Welding, Friction welding, Friction stir welding and Ultrasonic welding

UNIT-III.
    Bulk Deformation Processes: Hot working and cold working of metals-Forging processes-Open, impression and closed die forging-types of Forging machines-Typical forging operations-Swaging-Rolling of metals-Types of rolling mills-Flat strip rolling-Shape rolling operations-Defects in rolled parts-principle of rod and wire drawing-Tube drawing-Principles of extrusion-Types of Extrusion-hot and cold extrusion-Equipment used.

UNIT-IV

Sheet Metal Processes: Sheet metal characteristics-Typical shearing operations, bending and drawing operations, blanking, piercing, punching, trimming, etc. -formability of sheet metal-test methods of formability-Presses for sheet metal working, Elements of a simple die; punch and die clearances; Progressive, compound and combination dies and Blanking force Calculations. Special forming methods: Explosive forming, electromagnetic forming, electro hydraulic forming, composite mouldings.

UNIT-V

Powder Metallurgy: Definition-Advantages, Disadvantages/Limitations of powder metallurgy-Applications of powder metallurgy-Manufacture of parts by powder metallurgy-Production of metal powders-Blending of metal powders-pressing or compaction of metal powders-sintering-finishing operations.

Plastic Processing: Processing of plastics: General aspects-Plastic processing methods-compression moulding-Transfer moulding-Injection moulding-Expandable bead moulding-blow moulding-Extrusion.

Text books:

1. Production Technology: Manufacturing processes, Technology and Automation/R. K. Jain/Khanna Publications Pvt. Ltd, 2014, New edition.
2. Manufacturing processes for Engineering Materials/Kalpakjin S/ Pearson, 5th edition, 2007.
3. Principles of Metal Castings / Richard W. Heine, Carl R. Loper, Philip C. Rosenthal/ McGraw-Hill, 1967.
4. Welding Process and Technology/ R.S.Paramar/Khanna publisher, 3 edi, 2003.
5. Principles of Foundry *Technology*/P.L Jain/ Tata McGraw Hill Pub., Co. Ltd., 4th Edition,

Reference Books:

1. A text book of Production Engineering / Dr. P.C.Sarma/S.Chand Publications, New edition
2. Process and materials of manufacturing/Lindberg/ Pearson India/ 4 edi, 2015.
3. Production Engineering – Suresh Dalela & Ravi Shankar / Galgotia Publications Pvt. Ltd.
4. Production Technology / R.K. Jain/Khanna Publications Pvt. Ltd, 2010, edition.
5. Production Technology/ K L Narayana/ I K International Pvt Ltd, 2010 edition.

(19ME2214) MACHINE DRAWING

Pre-requisites: Engineering graphics

Course objectives:
1. To familiarize with the standard conventions for different materials and machine parts in working drawings.
2. To make part drawings including sectional views for various machine elements.
3. To prepare assembly drawings given the details of part drawings.

Course Outcomes:
1. Preparation of engineering and working drawings with dimensions and bill of material during design and development.
2. Developing assembly drawings using part drawings of machine components.

Introduction:
1. Conventional representation of materials, common machine elements and parts such as screws, nuts, bolts, keys, gears, webs, ribs.
2. Types of sections, sectional views.
3. Methods of dimensioning, general rules.
4. Title boxes and details – common abbreviations and their liberal usage.
5. Types of Drawings – working drawings for machine parts.

Drawing of Machine Elements and simple parts
Selection of Views, additional views for the following machine elements and parts with every drawing proportion.
1. Popular forms of Screw threads, bolts, nuts, stud bolts, tap bolts, set screws.
2. Keys, cottered joints and knuckle joint.
3. Rivetted joints for plates
4. Shaft coupling, spigot and socket pipe joint.
5. Journal, pivot and collar and foot step bearings.

Assembly Drawings:
Drawings of assembled views for the part drawings of the following using conventions and easy drawing proportions.

1. Steam engine parts – stuffing boxes, Eccentrics.

2. Machine tool parts: Tail stock, Machine Vices.

3. Other machine parts – Screws jacks, Petrol engine connecting rod.

4. Simple designs of spring loaded safety valve and air cock.

NOTE: First angle projection to be adopted. The student should be able to provide working drawings of actual parts.

Text books:
1. Machine Drawing by N D Bhatt Revise Edition 2016. Charotar Publishing.
2. Textbook of Computer Aided Machine Drawing S. Trymbaka Murthy 2017 – e EDITION.
3. A Textbook of Machine Drawing by Dhawan R K CHAND & CO – 2016 EDITION
4. Text book of Machine Drawing - P.S.Gill. S.K. Kataria & Sons - 2013 Edition - Reprint 2019.

Reference Books :
1. Machine Drawing / Ajeet Singh / Mc Graw Hill

2. Machine Drawing by / Bhattacharyya / Oxford

3. Machine Drawing - III edition K/L Narayana / Kannaiah Venkat Reddy New Age Publishing.

4. Machine Drawing with Auto CAD / Goutham Pohit, Goutam Ghosh / Pearson

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(19MB2211)BUSINESS ECONOMICS AND FINANCIAL ANALYSIS

Course Objective:
- To learn the basic Business types, impact of the Economy on Business and Firms specifically.
- To analyze the Business from the Financial Perspective.

Course Outcome:
- The students will understand the various Forms of Business and the impact of economic variables on the Business. The Demand, Supply, Production, Cost,Market Structure, Pricing aspects are learnt.
- The Students can study the firm‟s financial position by analysing the Financial Statements of a Company.

UNIT – I

Introduction to Business and Economics:Business: Structure of Business Firm, Theory of Firm, Types of Business Entities, Limited Liability Companies, Sources of Capital for a Company, Non-Conventional Sources of Finance.

Economics: Significance of Economics, Micro and Macro Economic Concepts, Concepts and Importance of National Income, Inflation, Money Supply in Inflation, Business Cycle, Features and Phases of Business Cycle. Nature and Scope of Business Economics, Role of Business Economist, Multidisciplinary nature of Business Economics.

UNIT – II

Demand and Supply Analysis:Elasticity of Demand: Elasticity, Types of Elasticity, Law of Demand, Measurement and Significance of Elasticity of Demand, Factors affecting Elasticity of Demand, Elasticity of Demand in decision making, Demand Forecasting: Characteristics of Good Demand Forecasting, Steps in Demand Forecasting, Methods of Demand Forecasting.

Supply Analysis: Determinants of Supply, Supply Function & Law of Supply.

UNIT - III

Production, Cost, Market Structures & Pricing:Production Analysis: Factors of Production, Production Function, Production Function with one variable input, two variable inputs, Returns to Scale, Different Types of Production Functions.

Cost analysis: Types of Costs, Short run and Long run Cost Functions.

Market Structures: Nature of Competition, Features of Perfect competition, Monopoly, Oligopoly, and Monopolistic Competition.

Pricing: Types of Pricing, Product Life Cycle based Pricing, Break Even Analysis, and Cost Volume Profit Analysis.

UNIT - IV

      Financial Accounting: Accounting concepts and Conventions, Accounting Equation, Double-Entry system of Accounting, Rules for maintaining Books of Accounts, Journal, Posting to Ledger, Preparation of Trial Balance, Elements of Financial Statements, Preparation of Final Accounts.

UNIT -V

      Financial Analysis through Ratios: Concept of Ratio Analysis, Liquidity Ratios, Turnover Ratios, Profitability Ratios, Proprietary Ratios, Solvency, Leverage Ratios (simple problems). Introduction to Fund Flow and Cash Flow Analysis (simple problems).

Text Books:

      1. D. D. Chaturvedi, S. L. Gupta, Business Economics - Theory and Applications, International Book House Pvt. Ltd. 2013.
      2. Dhanesh K Khatri, Financial Accounting, Tata McGraw Hill, 2011.
      3. Geethika Ghosh, Piyali Gosh, Purba RoyChoudhury, Managerial Economics, 2e, Tata McGraw Hill Education Pvt. Ltd. 2012.

Reference Books:

      1. Paresh Shah, Financial Accounting for Management 2e, Oxford Press, 2015.
      2. S. N. Maheshwari, Sunil K Maheshwari, Sharad K Maheshwari, Financial Accounting, 5e, Vikas Publications, 2013.

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(19ME2251) DYNAMICS OF MACHINERY LAB

Pre-requisites: Kinematics of machines and dynamics of machines

Course Objective:
The objective of the lab is to understand the kinematics and dynamics of mechanical elements such as linkages, gears, cams and learn to design such elements to accomplish desired motions or tasks.

Course Outcomes: Upon successful completion of this lab, students should be able to:
1. Understand types of motion.
2. Analyze forces and torques of components in linkages.
3. Understand static and dynamic balance.
4. Understand forward and inverse kinematics of open-loop mechanisms.

Experiments: (A Minimum of 10 experiments are to be conducted)
1. To determine the state of balance of machines for primary and secondary forces.
2. To determine the frequency of torsional vibration of a given rod.
3. Determine the effect of varying mass on the centre of sleeve in porter and proell governor.
4. The balance masses statically and dynamically for single rotating mass systems.
5. Determine the critical speed of a given shaft for different n-conditions.
6. For a simple pendulum determine time period and its natural frequency.
7. For a compound pendulum determine time period and its natural frequency.
8. Determine the effect of gyroscope for different motions.
9. Determine time period, amplitude and frequency of undamped free longitudinal vibration of single degree spring mass systems.
10. Determine the pressure distribution of lubricating oil at various load and speed of a Journal bearing.
11. Determine time period, amplitude and frequency of damped free longitudinal vibration of single degree spring mass systems

(19ME2252) FLUID MECHANICS AND HYDRAULIC MACHINES LAB

Pre- requisites: Fluid Mechanics Theory

Course Objectives:
1. To understand the basic principles of fluid mechanics.
2. To identify various types of flows.
3. To understand boundary layer concepts and flow through pipes.
4. To evaluate the performance of hydraulic turbines.
5. To understand the functioning and characteristic curves of pumps.

Course Outcomes:
1. Able to explain the effect of fluid properties on a flow system.
2. Able to identify type of fluid flow patterns and describe continuity equation.
3. To analyze a variety of practical fluid flow and measuring devices and utilize fluid mechanics principles in design.
4. To select and analyze an appropriate turbine with reference to given situation in power plants.
5. To estimate performance parameters of a given Centrifugal and Reciprocating pump.
6. Able to demonstrate boundary layer concepts.

List of Experiments:
1. Calibration of Venturi-meter.

2. Calibration of Orifice meter.

3. Determination of friction factor for a given pipe line.

4. Determination of loss of head due to sudden contraction in a pipeline.

5. Determination of loss of head due to sudden enlargement in a pipeline.

6. Verification of Bernoulli''s Theorems.

7. Impact of jets on Vanes.

8. Performance Test on Pelton Wheel Turbine.

9. Performance Test on Francis Turbine.

10. Performance Test on Kaplan Turbine.

11. Performance Test on Single Stage Centrifugal Pump.

12. Performance Test on Multi Stage Centrifugal Pump.

13. Performance Test on Reciprocating Pump.

14 Calibration of contracted Rectangular Notch and /or Triangular Notch.

15 Determination of Coefficient of discharge for an external mouth piece by variable head method.

16 Study of Hydraulic jump.

17 Determination of Coefficient of discharge for a small orifice by a constant head method.

NOTE: Any 10 of the above experiments are to be conducted.

(19ME2253) MANUFACTURING PROCESSES LAB

Pre-requisites: Manufacturing Technology

Course Objective:
Student will be able to learn and practice the various production processes like casting, melting, welding, forming and processing of plastics.

Course Outcomes: students are able to
1. Understanding the properties of moulding sands and pattern making.
2. Fabricate joints using gas welding and arc welding.
3. Evaluate the quality of welded joints.
4. Basic idea of press working tools and performs moulding studies on plastics.

List of Exercises

I. Metal Casting Lab:
    1. Pattern making - for one casting drawing.
    2. Sand properties testing - Exercise -for strength and permeability.
    3. Mould making.
    4. Melting and Casting – demonstration.

II. Welding Lab:
    1. Arc Welding.
    2. Spot Welding.
    3. TIG Welding.
    4. Gas Welding.
    5. Plasma Welding.

III. Mechanical Press Working:
    1. Blanking & Piercing operations and study of simple, compound and progressive press tools.
    2. Hydraulic Press: Deep drawing.
    3. Bending and other operations.

IV. Processing Of Plastics:
    1. Injection Moulding.
    2. Blow Moulding.

Reference Books:

    Dictionary of Mechanical Engineering – G.H.F. Nayler, Jaico Publishing Ho