

JNT UNIVERSITY KAKINADA, KAKINADA
MECHANICAL ENGINEERING - COURSE STRUCTURE – 2010 BATCH

II YEAR

I SEMESTER		P	C	II SEMESTER		P	C
1	Engineering Mechanics	4	4	1	Kinematics of Machinery	4	4
2	Fluid Mechanics & Hydraulic Machinery	4	4	2	Thermal Engineering -I	4	4
3	Thermodynamics	4	4	3	Production Technology	4	4
4	Managerial Economics & Financial Analysis	4	4	4	Mechanics of Solids	4	4
5	Electrical & Electronics Engineering	4	4	5	Metallurgy & Materials Science	4	4
6	Computer aided Engineering Drawing Practice	6	4	6	Machine Drawing	6	4
7	Electrical & Electronics Engg. Lab	3	2	7	Mechanics of Solids & Metallurgy lab	3	2
8	Fluid Mechanics & Hydraulic Machinery Lab	3	2	8	Production Technology Lab	3	2
9	English Communication Practice	2	-	9	English Communication Practice	2	2
			28				30

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
MECHANICAL ENGINEERING

II Year B.Tech. – I Sem.

ENGINEERING MECHANICS

UNIT – I

Introduction to Engg. Mechanics – Basic Concepts.

Systems of Forces : Coplanar Concurrent Forces – Components in Space – Resultant – Moment of Force and its Application – Couples and Resultant of Force Systems.**UNIT – II****Equilibrium of Systems of Forces** : Free Body Diagrams, Equations of Equilibrium of Coplanar Systems, Spatial Systems for concurrent forces. Lamis Theorem, Graphical method for the equilibrium of coplanar forces, Converse of the law of Triangle of forces, converse of the law of polygon of forces condition of equilibrium.**UNIT – III****Centroid** : Centroids of simple figures (from basic principles) – Centroids of Composite Figures**Centre of Gravity** : Centre of gravity of simple body (from basis principles), centre of gravity of composite bodies, pappus theorem.**UNIT – IV****Area moments of Inertia** : Definition – Polar Moment of Inertia, Transfer Theorem, Moments of Inertia of Composite Figures, Products of Inertia, Transfer Formula for Product of Inertia. **Mass Moment of Inertia** : Moment of Inertia of Masses, Transfer Formula for Mass Moments of Inertia, mass moment of inertia of composite bodies.**UNIT – V**

Analysis of perfect frames (Analytical Method) – Types of Frames – Assumptions for forces in members of a perfect frame, Method of joints, Method of sections, Force table, Cantilever Trusses, Structures with one end hinged and the other freely supported on rollers carrying horizontal or inclined loads.

UNIT – VI**Kinematics** : Rectilinear and Curvelinear motions – Velocity and Acceleration – Motion of Rigid Body – Types and their Analysis in Planar Motion. **Kinetics** : Analysis as a Particle and Analysis as a Rigid Body in Translation – Central Force Motion – Equations of Plane Motion – Fixed Axis Rotation – Rolling Bodies.**UNIT – VII****Work – Energy Method** : Equations for Translation, Work-Energy Applications to Particle Motion, Connected System-Fixed Axis Rotation and Plane Motion. Impulse momentum method.**UNIT – VIII****Friction** : Introduction , limiting friction and impending motion, coulomb's laws of dry friction , coefficient of friction, cone of friction. Applications of friction- impending motion of connected bodies , relative motion, ladder friction, wedges, screw friction.

TEXT BOOKS :

1. Engg. Mechanics ,Timoshenko & Young.
2. Engg. Mechanics, R.K. Bansal , Laxmi publications

REFERENCES :

1. Engineering Mechanics , Fedinand . L. Singer , Harper – Collins.
2. Engineering Mechanics statics and dynamics , A Nelson , Mc Gra Hill publications
3. Engg. Mechanics Umesh Regl, Tayal.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
MECHANICAL ENGINEERING**

II Year B.Tech. – I Sem.

FLUID MECHANICS AND HYDRAULIC MACHINERY

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.

UNIT II

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

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.

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.

Measurement of flow: pilot tube, venturimeter, and orifice meter, Flow nozzle, Turbine flow meter (Ref.4)

UNIT IV

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.

UNIT V

Hydroelectric power stations: Elements of hydro electric power station-types-concept of pumped storage plants-storage requirements, mass curve (explanation only) estimation of power developed from a given catchment area; heads and efficiencies.

UNIT VI

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.

UNIT VII

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

UNIT-VIII

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

Reciprocating pumps: Working, Discharge, slip, indicator diagrams

TEXT BOOKS:

1. Hydraulics, fluid mechanics and Hydraulic machinery MODI and SETH.
2. Fluid Mechanics and Hydraulic Machines by Rajput.

REFERENCE BOOKS:

1. Fluid Mechanics and Fluid Power Engineering by D.S. Kumar, Kotaria & Sons.
2. Fluid Mechanics and Machinery by D. Rama Durgaiyah, New Age International.
3. Hydraulic Machines by Banga & Sharma, Khanna Publishers.
4. Instrumentation for Engineering Measurements by James W. Dally, William E. Riley, John Wiley & Sons Inc. 2004 (Chapter 12 – Fluid Flow Measurements)

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
MECHANICAL ENGINEERING**

II Year B.Tech. – I Sem.

THERMODYNAMICS

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, Cycle – Reversibility – Quasi – static Process, Irreversible Process, Causes of Irreversibility – Energy in State and in Transition, Types, Work and Heat, Point and Path function.

UNIT II

Zeroth Law of Thermodynamics – Concept of Temperature – Principles of Thermometry –Reference Points – Const. Volume gas Thermometer – Scales of Temperature, Ideal Gas Scale – 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.

UNIT – III

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 – Elementary Treatment of the Third Law of Thermodynamics.

UNIT IV

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 – Clausius – Clapeyron Equation Property tables. Mollier charts – Various Thermodynamic processes and energy Transfer – Steam Calorimetry.

UNIT - V

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 – Deviations from perfect Gas Model – Vander Waals Equation of State – Compressibility charts – variable specific Heats – Gas Tables.

UNIT – VI

Mixtures of perfect Gases – Mole Fraction, Mass fraction 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 - VII

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.

UNIT VIII

Refrigeration Cycles : Brayton and Rankine cycles – Performance Evaluation – combined cycles, Bell-Coleman cycle, Vapour compression cycle-performance Evaluation.

TEXT BOOKS :

1. Engineering Thermodynamics , PK Nag , TMH, III Edition
2. Fundamentals of Thermodynamics – Sonntag, Borgnakke and van wylen , John Wiley & sons (ASIA) Pte Ltd.

REFERENCES :

1. Engineering Thermodynamics – Jones & Dugan
2. Thermodynamics – An Engineering Approach – Yunus Cengel & Boles ,TMH
3. Thermodynamics – J.P.Holman , McGrawHill

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, KAKINADA
MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS
Common to all Branches (w.e.f.2010 batch)

Unit I Introduction to Managerial Economics:

Introduction to Managerial Economics & Demand Analysis:

Definition of Managerial Economics, Characteristics and Scope – Managerial Economics and its relation with other subjects- Basic economic tools in Managerial Economics

Demand Analysis: Meaning- Demand distinctions- Demand determinants- Law of Demand and its exceptions.

Unit-II Elasticity of Demand & Demand Forecasting:

Definition -Types of Elasticity of demand - Measurement of price elasticity of demand: Total outlay method, Point method and Arc method- Significance of Elasticity of Demand.

Demand Forecasting: Meaning - Factors governing demand forecasting - Methods of demand forecasting (survey of buyers' Intentions, Delphi method, Collective opinion, Analysis of Time series and Trend projections, Economic Indicators, Controlled experiments and Judgmental approach) - Forecasting demand for new products- Criteria of a good forecasting method.

Unit-III Theory of Production and Cost Analysis: Production Function- Isoquants and Isocosts, MRTS, Law of variable proportions- Law of returns to scale- Least Cost Combination of Inputs, Cobb-Douglas Production function - Economies of Scale.

Cost Analysis: Cost concepts, Opportunity cost, Fixed Vs Variable costs, Explicit costs Vs. Implicit costs, Out of pocket costs vs. Imputed costs.-Determination of Break-Even Point (simple problems) - Managerial Significance and limitations of BEP.

UNIT-IV: Introduction to Markets, Managerial Theories of the Firm &

Pricing Policies: Market structures: Types of competition, Features of Perfect Competition, Monopoly and Monopolistic Competition. Price-Output Determination under Perfect Competition, Monopoly, Monopolistic Competition and Oligopoly

Managerial theories of the firm - Marris and Williamson's models.

Pricing Policies: Methods of Pricing-Marginal Cost Pricing, Limit Pricing, Market Skimming Pricing, Penetration Pricing, Bundling Pricing, and Peak Load Pricing.

Internet Pricing Models: Flat rate pricing, Usage sensitive pricing, Transaction based pricing, Priority pricing, charging on the basis of social cost, Precedence model, Smart market mechanism model.

Unit V Types of Industrial Organization & Introduction to business cycles: Characteristic features of Industrial organization, Features and evaluation of Sole Proprietorship, Partnership, Joint Stock Company, State/Public Enterprises and their types.

Introduction to business cycles: Meaning-Phases of business cycles- Features of business cycles.

Unit VI Introduction to Financial Accounting: Introduction to Double-entry system, Journal, Ledger, Trial Balance- Final Accounts (with simple adjustments)- Limitations of Financial Statements.

Unit VII Interpretation and analysis of Financial Statement: Ratio Analysis – Liquidity ratios, Profitability ratios and solvency ratios – Preparation of changes in working capital statement and fund flow statement.

Unit VIII Capital and Capital Budgeting: Meaning of capital budgeting, Need for capital budgeting – Capital budgeting decisions (Examples of capital budgeting) - Methods of Capital Budgeting: Payback Method, Accounting Rate of Return (ARR), IRR and Net Present Value Method (simple problems)

Text Books:

1. **J.V.Prabhakar Rao:** Managerial Economics and Financial Analysis, Maruthi Publications, 2011
2. **N. Appa Rao. & P. Vijaya Kumar:** ‘Managerial Economics and Financial Analysis’, Cengage Publications, New Delhi, 2011

References:

1. A R Aryasri - Managerial Economics and Financial Analysis, TMH 2011
2. Suma damodaran- Managerial Economics, Oxford 2011
3. S.A. Siddiqui & A.S. Siddiqui, Managerial Economics and Financial Analysis, New Age International Publishers, 2011.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
MECHANICAL ENGINEERING**

II Year B.Tech. – I Sem.

ELECTRICAL AND ELECTRONICS ENGINEERING

Part-A Electrical Engineering

UNIT - I

ELECTRICAL CIRCUITS: Basic definitions, Types of network elements, Ohm's Law, Resistive networks, Kirchhoff's Laws, Inductive networks, capacitive networks, Series, Parallel circuits and Star-delta and delta-star transformations.

UNIT - II

DC MACHINES : Principle of operation of DC Generator – emf equation - types – DC motor types – torque equation – applications – three point starter.

UNIT - III

TRANSFORMERS : Principle of operation of single phase transformers – emf equation – losses – efficiency and regulation

UNIT - IV

AC MACHINES : Principle of operation of alternators – regulation by synchronous impedance method –Principle of operation of induction motor – slip – torque characteristics – applications.

TEXT BOOKS:

1.Basic Electrical Engineering by Nagsarkar,Sukhija, Oxford Publications,2nd edition

REFERENCE BOOKS:

- 1.Basic Electrical Engineering by M.S.Naidu and S.Kamakshiah,TMH Publications
- 2.Fundamentals of Electrical Engineering by Rajendra Prasad, PHI Publications,2nd edition

Part – B Electronics Engineering

UNIT V

DIODE AND ITS CHARACTERISTICS: PN Junction Diode, Symbol, V-I Characteristics, Diode Applications, Rectifiers – Half wave, Full wave and Bridge Rectifiers (Problems)

UNIT VI

TRANSISTORS: PNP and NPN Junction Transistor, Transistor as an Amplifier, Single Stage CE Amplifier, Frequency Response of CE Amplifier, Concepts of Feedback Amplifier, Necessary conditions for Oscillators, SCR Characteristics and applications

UNIT VII

INDUCTION HEATING: Theory of Induction Heating, Application to Industries

DIELECTRIC HEATING: Theory of Dielectric Heating and its Industrial Applications

ULTRASONICS: Generation, Flow detection and other Applications

UNIT VIII

TRANSDUCERS AND MEASURING INSTRUMENTS: Principles of Strain Gauge, LVDT, Thermocouples, Thermistors, Piezo-electric transistors, CRO Principles and application, Voltage, Current and Frequency Measurements, Digital Multimeters.

TEXT BOOKS:

1. Electronic Devices and Circuits, R.L. Boylestad and Louis Nashelsky, 9th edition, PEI/PHI

2006.

2. Industrial Electronics by G.K. Mittal, PHI

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
MECHANICAL ENGINEERING**

II Year B.Tech. – I Sem.

COMPUTER AIDED ENGINEERING DRAWING PRACTICE

PART A:

UNIT – I

PROJECTIONS OF PLANES & SOLIDS : Projections of Regular Solids inclined to both planes – Auxiliary Views. Sections and Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views.

UNIT – II

DEVELOPMENT AND INTERPENETRATION OF SOLIDS: Development of Surfaces of Right Regular Solids – Prisms, Cylinder, Pyramid Cone and their parts. Interpenetration of Right Regular Solids – Intersection of Cylinder Vs Cylinder, Cylinder Vs Prism, Cylinder Vs Cone.

UNIT – III

ISOMETRIC PROJECTIONS : Principles of Isometric Projection – Isometric Scale – Isometric Views – Conventions – Isometric Views of Lines, Plane Figures, Simple and Compound Solids – Isometric Projection of objects having non- isometric lines. Isometric Projection of Spherical Parts.

TRANSFORMATION OF PROJECTIONS: Conversion of Isometric Views to Orthographic Views – Conventions.

UNIT – IV

PERSPECTIVE PROJECTIONS: Perspective View: Points, Lines, Plane Figures and Simple Solids, Vanishing Point Methods (General Method only).

PART B:

UNIT – V

Introduction to Computer aided Drafting: Generation of points, lines, curves, polygons, dimensioning.

UNIT – VI

Types of modeling : object selection commands – edit, zoom, cross hatching, pattern filling, utility commands, 2D wire frame modeling, 3D wire frame modeling,.

UNIT – VII

View points and view ports: view point coordinates and view(s) displayed, examples to exercise different options like save, restore, delete ,joint , single option.

UNIT-VIII

Computer aided Solid Modeling: Isometric projections, orthographic projections of isometric projections ,Modeling of simple solids, Modeling of Machines & Machine Parts.

TEXT BOOKS :

1. Engineering Graphics, K.C. John, PHI Publications

2. Machine Drawing, K.LNarayana ,P. Kannaiah and K.venkata reddy / New age international publishers.

References:

1. Autocad 2009 , Galgotia publications , New Delhi
2. Text book of Engineering Drawing with Auto-CAD , K.venkata reddy/B.S . publications.
3. Engineering drawing by N.D Bhatt , Charotar publications.

Mode of examination for Computer Aided Engineering Graphics Practice

The syllabus in respect of the subject "Computer Aided Graphics Practice" for II B Tech I sem (Mech, Civil, Automobile, Aeronautical, Mining Engg) students consists of two major portions

Part A: Unit I to IV - conventional drawing pattern

Part B: Unit V to VIII - computer lab pattern using any drafting packages

Classwork - 6 hrs per week & Credits - 4

Max Marks - 100 Internal Marks: 25 & External Marks: 75

It is suggested that the examination in respect of the above may conducted on par with lab by the concerned college with the following pattern:

Mid Exam: I Mid Exam from Part A (first Four Units) - Conventional Drawing Exam
II Mid Exam Part B (from last Four Units) - In Computer Lab

End Exam: Duration - 4 hrs

Part A - Conventional Drawing test in Drawing Hall from Part A (first FOUR Units) - 2 hrs duration.

Part B - Exam in Computer Lab using any drafting package Part B (last four units) - 2 hrs duration.

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MECHANICAL ENGINEERING**

II Year B.Tech. – I Sem.

ELECTRICAL & ELECTRONICS ENGG. LAB

PART A: Electrical Engineering Lab:

The following experiments are required to be conducted as compulsory experiments :

1. Swinburne's test on D.C. Shunt machine. (Predetermination of efficiency of a given D.C. Shunt machine working as motor and generator).
2. OC and SC tests on single phase transformer (Predetermination of efficiency and regulation at given power factors)
3. Brake test on 3-phase Induction motor (Determination of performance characteristics)
4. Regulation of alternator by Synchronous impedance method.
5. Speed control of D.C. Shunt motor by
 - a) Armature Voltage control b) Field flux control method
6. Brake test on D.C Shunt Motor

Section B: Electronics Engineering :

1. Transistor CE Characteristics (Input and Output)
2. Full wave Rectifier with and without filters.
3. CE Amplifiers.
4. RC Phase Shift Oscillator
5. Class A Power Amplifier
6. Micro Processor

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MECHANICAL ENGINEERING**

II Year B.Tech. – I Sem.

FLUID MECHANICS & HYDRAULIC MACHINERY LAB

1. Impact of jets on Vanes.
2. Performance Test on Pelton Wheel.
3. Performance Test on Francis Turbine.
4. Performance Test on Kaplan Turbine.
5. Performance Test on Single Stage Centrifugal Pump.
6. Performance Test on Multi Stage Centrifugal Pump.
7. Performance Test on Reciprocating Pump.
8. Calibration of Venturimeter.
9. Calibration of Orifice meter.
10. Determination of friction factor for a given pipe line.
11. Determination of loss of head due to sudden contraction in a pipeline.
12. Turbine flow meter.

Note : Any 10 of the above 12 experiments are to be conducted.

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MECHANICAL ENGINEERING

II Year B.Tech. – II Sem.

KINEMATICS OF MACHINERY

UNIT – I

MECHANISMS : Elements or Links – Classification – Rigid Link, flexible and fluid link – Types of kinematic 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 .

Khuzralrs criteria , Grashoff's law , Degrees of freedom ,Kutzbach criterion for planar mechanisms, Mechanism and machines – classification of machines – kinematic chain – inversion of mechanism – inversion of mechanism – inversions of quadric cycle, chain – single and double slider crank chains.

UNIT - II

STRAIGHT LINE MOTION MECHANISMS : Exact and approximate copiers and generated types – Peaucellier, Hart and Scott Russel – Grasshopper – Watt T. Chebicheff and Robert Mechanisms and straight line motion, Pantograph.

UNIT – III

KINEMATICS : Velocity and acceleration – Motion of link in machine – Determination of Velocity and acceleration diagrams – 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, Kleins construction, Coriolis acceleration, determination of Coriolis component of acceleration.

Plane motion of body : Instantaneous center of rotation, centroids and axodes – relative motion between two bodies – Three centres in line theorem – Graphical determination of instantaneous centre, diagrams for simple mechanisms and determination of angular velocity of points and links.

UNIT – IV

STEERING Mechanisms : Conditions for correct steering – Davis Steering gear, Ackermans steering gear – velocity ratio.

HOOKE'S JOINT : Single and double Hooke's joint – Universal coupling – application – problems.

UNIT – V

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 3 cases.

Analysis of motion of followers : Roller follower – circular cam with straight, concave and convex flanks.

UNIT – VI

Gears :

Higher pairs, friction wheels and toothed gears – types – law of gearing, condition for constant velocity ratio for transmission of motion, Form of teeth: cycloidal and involute profiles. Velocity of sliding – phenomena of interferences – Methods of interference. Condition for minimum number of teeth to avoid interference, expressions for arc of contact and path of contact – Introduction to Helical, Bevel and worm gearing.

UNIT – VII

Belt Rope and Chain Drives : Introduction, Belt and rope drives, selection of belt drive- types of belt drives, V-belts, materials used for belt and rope drives, velocity ratio of belt drives, slip of belt, creep of belt, tensions for flat belt drive, angle of contact, centrifugal tension, maximum tension of belt, Chains-length, angular speed ratio, classification of chains.

UNIT – VIII

GEAR TRAINS: Introduction – Train value – Types – Simple and reverted wheel train – Epicyclic gear Train. Methods of finding train value or velocity ratio – Epicyclic gear trains. Selection of gear box- Differential gear for an automobile.

TEXT BOOKS:

1. Theory of Machines by Thomas Bevan/ CBS
2. Theory of machines – PL. Balaney/khanna publishers.

REFERENCES:

1. Theory of Machines Sadhu Singh Pearsons Edn
2. The theory of Machines /Shiegley/ Oxford.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
MECHANICAL ENGINEERING**

II Year B.Tech. – II Sem.

THERMAL ENGINEERING - I

UNIT – I

Actual Cycles and their Analysis: Introduction, Comparison of Air Standard and Actual Cycles, Time Loss Factor, Heat Loss Factor, Exhaust Blowdown-Loss due to Gas exchange process, Volumetric Efficiency. Loss due to Rubbing Friction, Actual and Fuel-Air Cycles Of CI Engines.

UNIT-II

I.C. ENGINES : Classification - Working principles, Valve and Port Timing Diagrams, Air – Standard, air-fuel and actual cycles - Engine systems – Fuel, Carburetor, Fuel Injection System, Ignition, Cooling and Lubrication, principle of wankle engine.

UNIT – III

Combustion in S.I. Engines : Normal Combustion and abnormal combustion – Importance of flame speed and effect of engine variables – Type of Abnormal combustion, pre-ignition and knocking (explanation of) – Fuel requirements and fuel rating, anti knock additives – combustion chamber – requirements, types.

UNIT IV

Combustion in C.I. Engines : Four stages of combustion – Delay period and its importance – Effect of engine variables – Diesel Knock– Need for air movement, suction, compression and combustion induced turbulence – open and divided combustion chambers and nozzles used – fuel requirements and fuel rating.

UNIT – V

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.

UNIT – VI

COMPRESSORS – Classification –positive displacement and roto dynamic machinery – Power producing and power absorbing machines, fan, blower and compressor – positive displacement and dynamic types – reciprocating and rotary types.

Reciprocating : Principle of operation, work required, Isothermal efficiency volumetric efficiency and effect of clearance, stage compression, undercooling, saving of work, minimum work condition for stage compression.

UNIT VII

Rotary (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.

UNIT-VIII

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.

TEXT BOOKS:

1. I.C. Engines / V. GANESAN- TMH
2. Heat engines, vasandan & Kumar publications Thermal

REFERENCES:

1. IC Engines – Mathur & Sharma – Dhanpath Rai & Sons.
2. Thermal Engineering / Rudramoorthy - TMH
3. I.C. Engines / Heywood /McGrawHill.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
MECHANICAL ENGINEERING**

II Year B.Tech. – II Sem.

PRODUCTION TECHNOLOGY

UNIT – I

CASTING : Steps involved in making a casting – Advantage of casting and its applications. – Patterns and Pattern making – Types of patterns – Materials used for patterns, pattern allowances and their construction, Principles of Gating, Gating ratio and design of Gating systems

UNIT – II

Solidification of casting – Concept – Solidification of pure metal and alloys, short & long freezing range alloys. Risers – Types, function and design, casting design considerations, special casting processes 1) Centrifugal 2) Die, 3) Investment.

Methods of Melting : Crucible melting and cupola operation, steel making processes, special.

UNIT – III

A) Welding : Classification of welding process types of welds and welded joints and their characteristics, design of welded joints, Gas welding, ARC welding-sub merged, electron beam welding, solid state welding process, Forge welding, resistance welding, Thermit welding and Plasma welding.

B) Cutting of Metals: Oxy – Acetylene Gas cutting, plasma cutting. Cutting of ferrous, non-ferrous metals.

UNIT – IV

Inert Gas welding, TIG & MIG, MAG /CO₂ welding, Friction welding, Induction welding, Explosive welding, Laser welding, Soldering & Brazing. Heat affected zones in welding; pre & post heating, weld ability of metals

welding defects – causes and remedies – destructive nondestructive testing of welds.

UNIT – V

Hot working, cold working, strain hardening, recovery, recrystallisation and grain growth, Comparison of properties of Cold and Hot worked parts, Rolling fundamentals – theory of rolling, types of Rolling mills and products. Forces in rolling and power requirements.

UNIT - VI

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- VII

EXTRUSION OF METALS : Basic extrusion process and its characteristics. Hot extrusion and cold extrusion - Forward extrusion and backward extrusion – Impact extrusion Hydrostatic extrusion.

Forging processes: Principles of forging – Tools and dies – Types Forging – Smith forging, Drop Forging– Roll forging – Forging hammers : Rotary forging – forging defects.

UNIT - VIII

Processing of Plastics: Types of Plastics, Properties, applications and their Processing methods & Equipment (blow & injection modeling)

TEXT BOOKS:

1. Manufacturing Engineering and Technology/Kalpakjin S/ Pearson Edu.
2. Manufacturing Technology / P.N. Rao/TMH

REFERENCES :

1. Production Technology, R.K. Jain
2. Process and materials of manufacturing –Lindberg, PE
3. Principles of Metal Castings, Roenthal.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
MECHANICAL ENGINEERING**

II Year B.Tech. – II Sem.

MECHANICS OF SOLIDS

UNIT – I

SIMPLE STRESSES & STRAINS : Elasticity and plasticity – Types of stresses & strains–Hooke's law – stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio & volumetric strain – Elastic moduli & 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, u.d.l., uniformly varying loads and combination of these loads – Point of contra flexure – 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 bending stresses – section modulus of rectangular and circular sections (Solid and Hollow), I,T, Angle and Channel sections – Design of simple beam sections.

UNIT – IV

SHEAR STRESSES : Derivation of formula – Shear stress distribution across various beams sections like rectangular, circular, triangular, I, T angle sections.

UNIT – V

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

UNIT – VI

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 – VII

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.

UNIT – VIII

Thick cylinders–lame's equation – cylinders subjected to inside & out side pressures –compound cylinders.

TEXT BOOKS :

1. Strength of materials by Bhavikatti, Lakshmi publications.
2. Solid Mechanics, by Popov

REFERENCES :

1. Strength of Materials -By Jindal, Umesh Publications.
2. Analysis of structures by Vazirani and Ratwani.
3. Mechanics of Structures Vol-III, by S.B.Junnarkar.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
MECHANICAL ENGINEERING**

II Year B.Tech. – II Sem.

METALLURGY & MATERIAL SCIENCE

UNIT – I

Structure of Metals : Bonds in Solids – Metallic bond - crystallization of metals, grain and grain boundaries, effect of grain boundaries on the properties of metal / alloys – determination of grain size.

UNIT - II

Constitution of Alloys : Necessity of alloying, types of solid solutions, Hume Rotherys rules, intermediate alloy phases, and electron compounds.

UNIT -III

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, Cus-Sn and Fe-Fe₃C.

UNIT -IV

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 plain carbon steels, Low alloy steels, Hadfield manganese steels, tool and die steels.

UNIT – V

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.

UNIT - VI

Non-ferrous Metals and Alloys : Structure and properties of copper and its alloys, Aluminium and its alloys, Titanium and its alloys.

UNIT – VII

Ceramic materials : Crystalline ceramics, glasses, cermaets, abrasive materials, nanomaterials – definition, properties and applications of the above.

UNIT - VIII

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.

TEXT BOOKS :

1. Introduction to Physical Metallurgy / Sidney H. Avener.
2. Elements of Material science / V. Rahghavan

REFERENCES :

1. An introduction to Metallurgy , sir Alan Cottrell , second edition universities press (India) private limited
2. Engineering materials and metallurgy/R.K.Rajput/ S.Chand.
3. Science of Engineering Materials / Agarwal

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
MECHANICAL ENGINEERING**

II Year B.Tech. – II Sem.

MACHINE DRAWING

Machine Drawing Conventions :

Need for drawing conventions – introduction to IS conventions

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

I. Drawing of Machine Elements and simple parts

Selection of Views, additional views for the following machine elements and parts with every drawing proportions.

- a) Popular forms of Screw threads, bolts, nuts, stud bolts, tap bolts, set screws.
- b) Keys, cottered joints and knuckle joint.
- c) Rivetted joints for plates
- d) Shaft coupling, spigot and socket pipe joint.
- e) Journal, pivot and collar and foot step bearings.

II. Assembly Drawings:

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

- a) Engine parts – stuffing boxes, cross heads, Eccentrics, Petrol Engine connecting rod, piston assembly.
- b) Other machine parts - Screws jacks, Machine Vices Plummer block, Tailstock.
- c) Valves : Steam stop valve, spring loaded safety valve, feed check 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 – Dhawan, S.Chand Publications
2. Machine Drawing –K.L.Narayana, P.Kannaiah & K. Venkata Reddy / New Age/ Publishers

REFERENCES:

1. Machine Drawing – P.S.Gill.
2. Machine Drawing – Luzzader
3. Machine Drawing - Rajput

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MECHANICAL ENGINEERING**

II Year B.Tech. – II Sem.

MECHANICS OF SOLIDS & METALLURGY LAB

Any 6 experiments from each section A and B .

(A) METALLURGY LAB :

1. Preparation and study of the Micro Structure of pure metals like Iron, Cu and Al.
2. Preparation and study of the Microstructure of Mild steels, low carbon steels, high – C steels.
3. Study of the Micro Structures of Cast Irons.
4. Study of the Micro Structures of Non-Ferrous alloys.
5. Study of the Micro structures of Heat treated steels.
6. Hardeneability of steels by Jominy End Quench Test.
7. To find out the hardness of various treated and untreated steels.

(B) MECHNICS OF SOLIDS LAB :

1. Direct tension test
2. Bending test on
 - a) Simple supported
 - b) Cantilever beam
3. Torsion test
4. Hardness test
 - a) Brinells hardness test
 - b) Rockwell hardness test
5. Test on springs
6. Compression test on cube
7. Impact test
8. Punch shear test

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MECHANICAL ENGINEERING**

II Year B.Tech. – II Sem.

PRODUCTION TECHNOLOGY LAB

Minimum of 12 Exercises need to be performed

I. METAL CASTING LAB :

1. Pattern Design and making - for one casting drawing.
2. Sand properties testing - Exercise -for strengths, and permeability – 1
3. Moulding Melting and Casting - 1 Exercise

II WELDING LAB :

1. ARC Welding Lap & Butt Joint - 2 Exercises
2. Spot Welding - 1 Exercise
3. TIG Welding - 1 Exercise
4. Plasma welding and Brazing - 2 Exercises
(Water Plasma Device)

III MECHANICAL PRESS WORKING :

1. Blanking & Piercing operation and study of simple, compound and progressive press tool.
2. Hydraulic Press : Deep drawing and extrusion operation.
3. Bending and other operations

IV PROCESSING OF PLASTICS

1. Injection Moulding
2. Blow Moulding