GOVERNMENT COLLEGE OF ENGINEERING, JALGAON.

Department of (Mechanical Engineering).

Scheme for B. Tech. (Mechanical Engineering)

SEM III

Course Code	Name of the Course	Group	Teaching Scheme Hrs /week				Evaluation Scheme							Credits
							Theory				Practical		Total	
			TH	TUT	PR	Total	ISA	ISE1	ISE2	ESE	ICA	ESE		
ME201	Fluid Mechanics	D	3	1	---	4	10	15	15	60	---	---	100	4
SH 202	Engineering Mathematics-III	A	3	1	---	4	10	15	15	60	---	---	100	4
ME202	Engineering Thermodynamics	D	3	---	---	3	10	15	15	60	---	---	100	3
ME203	Manufacturing Engineering	D	3	---	---	3	10	15	15	60	---	---	100	3
CE 221	Strength of Materials	B	3	---	---	3	10	15	15	60	---	---	100	3
SH 204	General Proficiency II	C	1	---	2	3	---	---	---	---	25	25	50	2
ME204	Fluid Mechanics Lab	D	---	---	2	2	---	---	---	---	25	25	50	1
ME205	Engineering Thermodynamics Lab	D	---	---	2	2	---	---	---	---	25	25	50	1
ME206	Workshop Practice-III	D	---	---	2	2	---	---	---	---	50	--	50	1
CE222	Strength of Materials Lab	B	---	---	2	2	---	---	---	---	50	--	50	1
		Total	**16**	**2**	**10**	**28**	**50**	**75**	**75**	**300**	**175**	**75**	**750**	**23**

TH: Theory Lecture, TUT: Tutorial, PR: Practical

ISA :Internal Sessional Assessment ISE : In Semester Examination ESE: End Semester Examination ICA : Internal Continuous Assessment

ME201 FLUID MECHANICS

Teaching Scheme: 03L+ 01T, Total: 04 **Credit: 04**
Evaluation Scheme: 15 ISE1 + 15 ISE2 + 10 ISA + 60 ESE **Total Marks: 100**
Duration of ESE: 3 hours

COURSE DESCRIPTION:

This course provides basics of Fluid mechanics and machines. Course includes fluid, its definition, types of fluid. Types of flows, practical application of Bernoulli's Equation, Viscous and Boundary layer flow, Dimensional analysis & its methods, Buckingham theorem, Flow through pipes, Centrifugal pump & introduction to Reciprocating Pump**.**

DESIRABLE AWARENESS/SKILLS:

Fundamental knowledge of mathematics, Physics and thermodynamics.

COURSE OBJECTIVE:

The prime objective of offering this course is to familiarize with,

1. Types of fluids, properties of various fluids, ,
2. Behavior fluid statics, fluid kinematics & fluid dynamics.
3. Types of flows
4. Pipes & Pumps with their efficiency.

COURSE OUTCOMES:

On completion of this course; student shall be able to:

1. Explain fundamentals & definitions of Fluid Mechanics.
2. Describe various properties of fluid.
3. Ability enhancement for the analysis of fluids under static, kinematic and dynamic states

RELEVANCE OF COS / POS AND STRENGTH OF CO- RELATION:

PO/CO	CO-1	CO-2	CO-3
PO-a	3	3	1
PO-b	3	3	3
PO-c	2	3	3
PO-g	2	2	3
PO-h	1	2	2
PO-j	2	2	3

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Fluid properties and Hydrostatic

Fluid properties & its definitions, definition of fluid, Viscosity, Bulk modulus of elasticity, Vapor pressure, Surface tension, Capillarity, Manometers , Pascal's law, Hydrostatic law its derivation , Total pressure & Centre of pressure on vertical, horizontal, inclined, curved surface its derivation ,Concept Of buoyancy & flotation, Meta centre, metacentric height its derivation. Stability, unstability, equilibrium of floating & submerged body.

Fluid Kinematics and Dynamics

Types of flow, Definition of steady, Unsteady, Uniform, Non uniform, Laminar, Turbulent, Compressible, incompressible, rotational, Irrotational flow, 1D-2D flows, Stream line, Streak line, Path line, concept of Velocity, potential & stream function flow net (no numerical treatment), Continuity equation for steady, Unsteady, Uniform, Non uniform, Compressible incompressible,2D Euler's equation, Bernoulli's equation along a stream line for incompressible flow, Practical applications of Bernoulli's equation - Pitot tube, Venturi meter, Orifice meter.

Viscous and Boundary Layer Flow

kinetic and momentum energy correction factor, Power absorbed in viscous flow, viscous resistance to journal bearing, footstep bearing, collar bearing. Introduction to boundary layer flow, laminar and turbulent boundary layer, laminar sub layer, boundary layer thickness, displacement thickness, momentum thickness, separation of boundary layer. (No numerical treatment)

Dimensional Analysis and Flow Through Pipes

Introduction to dimensional analysis, dimensional homogeneity, methods of dimensional analysis-Rayleigh's method, Buckingham's π-theorem, dimensionless numbers. (No numerical treatment), Loss of energy in pipes, loss of energy due to friction, minor energy losses, concept of HGL and TEL, flow through syphon, flow trough pipes in series or compound pipes, equivalent pipe, parallel pipes, branched pipes. Power transmission through pipes. Water hammer phenomenon.

Centrifugal and Reciprocating Pump

Introduction to main parts of centrifugal pump, working & construction of centrifugal pump, types of impellers, types of casings, priming. Work done on centrifugal pump, various heads and efficiencies of centrifugal pump, minimum starting speed of a centrifugal pump, multistage centrifugal pump, principles of similarity applied to centrifugal pump. Specific speed, NPSH, cavitations in pumps. Introduction to main parts of Reciprocating pump, construction & working of Reciprocating pump, classification of Reciprocating pump, slip of reciprocating pump, air vessels. (No numerical on Reciprocating pump)

Text Books:

1. Fluid Mechanics and Hydraulics, Dr. Jagdish Lal, 9th edition, Metropolitan book co.pvt ltd, New Delhi, Reprint 2014.
2. Fluid mechanics and Hydraulic machines, Dr. R. K. Bansal, 9th edition, Laxmi Publication, Delhi, 2015

Reference Books:

1. Introduction to Fluid Mechanics and Fluid Machines, 3rd Edition by S. K. Som, G. Biswas, S. Chakraborty, Tata Mc Graw Hill Education, 2011
2. Fluid Mechanics, Special Indian Edition F.M. White, Tata Mc Graw Hill Education, 2007
3. Fluid Mechanics and Machines, C.P Kotharduraon and R. Rudramoorthy, 2nd edition, New Age Internationals, 2007

4. Hydraulics and Fluid Mechanics Including Hydraulics Machines, Dr. P.N.Modi, Dr. S.M. Seth, Standard Book House / Rajsons Publications p ltd, Delhi, 18th Edition, 2009.
5. Fluid Mechanics, Mohanty A.K., 2nd Edition, Prentice-Hall of India Private Limited, 2004.
6. Fluid Mechanics, Victor L. Streeter & Benjamin Wylie, First SI Metric Edition, Tata McGraw Hill (SI), 1983.

SH 202: ENGINEERING MATHEMATICS – III

Teaching Scheme : 03L+01T, Total: 04 **Credit: 04**
Evaluation Scheme: 15 ISE 1 + 15 ISE 2 +10 ISA +60 ESE **Total Marks: 100**
Duration of ESE : 03 Hrs

COURSE DESCRIPTION:

This course provides the elementary level knowledge of Linear Differential Equations, Transforms, Statistics and Probability Distributions. Course includes solution of nth order linear differential equations, solution of one and two dimensional heat equation, Laplace transform, Fourier transform, and probability distribution and basic of vector differentiation.

DESIRABLE AWARENESS/SKILLS:

Fundamental knowledge of Elementary mathematics and physics.

COURSE OBJECTIVE:

The prime objective of offering this course is to familiarize with,

1. Adequate knowledge of mathematics that will enable them in formulating problems and solving problems analytically
2. Solve related problems which will enable them to understand the subject and their Engineering Applications

COURSE OUTCOMES:

On completion of this course; student shall be able to:

1. Knowledge of mathematical principles and formulae in various applications of Mechanical Engg. in various courses.
2. Solve Engineering problems using principles of differential equations.

RELEVANCE OF COS / POS AND STRENGTH OF CO- RELATION:

PO/CO	CO-1	CO-2
PO-b	3	3
PO-c	1	2
PO-g	2	3

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

SH 202: ENGINEERING MATHEMATICS – III

Year: S Y B Tech (Mech) Sem: III

Teaching Scheme : 03L+01T Total: 04
Evaluation Scheme: 15 ISE 1 + 15 ISE 2 +10 ISA +60 ESE **Credit: 04**
Duration of ESE : 03 Hrs **Total Marks: 100**

Higher order linear differential equations: nth order linear differential equations with constant coefficient, complementary function and particular integrals, general method, short cut method, method of variation of parameters, linear differential equations with variable coefficient: Cauchy's differential equations and Legendre's differential equations, simultaneous linear differential equations, applications: deflection of beams, vibrating springs: damping and undamping.

Partial differential equations: Lagrange's form, linear PDE with constant coefficients, CF and PI, Method of separation of variables, application to vibrating string-Wave equation, application to one dimensional heat flow- Diffusion equation, application to two dimensional heat flow-Laplace equation, Numerical Methods for partial differential equation. [Finite Difference Method]

Laplace transform: Definition of Laplace transform, Laplace transform of elementary functions, Properties of Laplace transform, Laplace transform of special functions: Unit step function, Dirac-delta function and Periodic functions, Inverse Laplace transform: definition and properties, Inverse Laplace transform by partial fraction, convolution theorem, using standard results, application of Laplace transform to linear differential equations.

Fourier transforms and Vector differentiation: Fourier integrals, Fourier sine and cosine integrals, Fourier transform, Fourier sine and cosine transform, Inverse Fourier transform, vector differentiation and its physical interpretation, applications to mechanics, vector differential operator, gradient, divergence and curl ,directional derivatives, solenoidal and irrotational fields, vector identities.

Statistics and probability distributions: Measures of central tendency, dispersion, moments, skewness and kurtosis, correlation coefficient, lines of regression, curve fitting, method of least square, straight lines, second degree parabola, exponential and power curves. Probability distribution: binomial distribution, Poisson distribution, normal distribution.

Text books:

1. A text book of Engineering Mathematics (Vol-I and II) by P.N.Wartikar and J.N.Wartikar, 07th edition, Pune Vidhyarthi Griha Prakashan, Pune, 2013.
2. A text book of Engineering Mathematics, by N.P.Bali & Manish Goyal, 09th edition, Laxmi Prakashan, 2014.

Reference books:

1. Advanced Engineering Mathematics by Erwin Kreyszig, 8th edition ,Willey Eastern Ltd. Mumbai, 2013.
2. Higher Engineering Mathematics by B. S. Grewal, 33rd edition , Khanna Publication, New Delhi, 1996.
3. Advanced Engineering Mathematics by H. K. Dass, 12th edition, S. Chand Publication, New Delhi, 2003
4. Higher Engineering Mathematics by B. V. Ramana, 12th edition , Tata McGraw Hill, Delhi, 2011.

ME202 - ENGINEERING THERMODYAMICS

Teaching Scheme: 03L, Total: 03 **Credit: 03**
Evaluation Scheme: 15 ISE1+15 ISE2+10 ISA+60 ESE **Total Marks: 100**
Duration of ESE: 03 Hrs.

COURSE DESCRIPTION:

The course aims at imparting knowledge of basic Thermodynamics. course includes concept of system, surrounding and boundary, cycle, processes, Zeroth law, First law and its application, limitation of first law, statement of Second law, Carnot cycle, Clausius theorem, Ideal gas processes with their presentation on P- V & T-S plane, and properties of steam.

DESIRABLE AWARENESS/SKILLS:

Fundamental knowledge of Physics, Chemistry and Mathematics.

COURSE OBJECTIVE:

The prime objective of offering this course is to familiarize with,

1. Understand various types of energies and its applications in thermodynamic systems
2. Applying thermodynamic concepts to thermodynamic systems
3. Know various laws of thermodynamics and applications to thermodynamic system
4. Application of ideal gas processes to thermodynamic systems
5. Study steam properties, Interpret steam tables and Mollier charts with numerical applications

COURSE OUTCOMES:

On completion of this course; student shall be able to:

1. Accustom with type of energy and thermodynamic systems
2. Apply First law of thermodynamics
3. Analyze thermodynamic systems
4. Analyze thermodynamic cycle performance

RELEVANCE OF COS / POS AND STRENGTH OF CO- RELATION:

PO/CO,	CO-1	CO-2	CO-3	CO-4
PO-a	3	3	1	1
PO-b	2	2	1	1
PO-g	3	1	3	2

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Introduction to Engineering Thermodynamics.

Scope and applications of thermodynamics, System, surroundings boundary, control volume, types of system, unit and dimensions, Macroscopic and Microscopic view point, Thermodynamic Properties, Path function, Point function, State and Equilibrium, Process, Cycle, Quasi-static process and its significance. Energy, Flow Energy, Potential energy, Kinetic energy, Heat transfer, sign convention, Numerical. Work transfer, shaft work, displacement work, power, Numerical. Zeroth law of thermodynamics, temperature, temperature scales, Numerical on temperature measurement, Pressure, Absolute and gauge pressure, simple manometer, Bourdon pressure gauge.

First Law of Thermodynamics

Joule's experiment, internal energy as a property, 1st law of thermodynamics, First Law applied to closed system undergoing a cycle, PMM-I Numerical on application of First law to closed system. Enthalpy and internal energy of an ideal gas, specific heat, Cv and Cp., Principles of conservation of mass and energy, steady flow process, continuity equation. Steady flow energy equation (SFEE), applications of SFEE, Significance of $-\int vdP$, relation between $\int Pdv$ and $-\int vdP$, Numerical on application of First law to steady flow systems.

Second Law of Thermodynamics

Limitations of First Law, thermal reservoir, heat engine & its efficiency, Refrigerator and Heat pump, Coefficient of Performance, Statements of second law, Equivalence of statements of second law, PMM-II, Numerical on application of Second law, Reversibility and Irreversibility, Causes of irreversibility, Carnot cycle, Reversed Carnot cycle, their analysis, Carnot theorem, Absolute temperature scale, Numerical on Carnot cycle, Carnot theorem and temperature scales. Entropy – Introduction, Entropy as property, Clausius theorem, Clausius statement, Clausius inequality, Entropy principle

Properties of Ideal Gases

Ideal gas, Laws for an ideal gas, Equation of state, Universal gas constant, Characteristic gas constant, Relation between Cp, Cv and R, Ideal Gas Processes, their presentation on p-v, T-S plane, Analysis for Heat transfer, Work transfer, change in Internal Energy, enthalpy and Entropy -Isobaric, Isochoric and Isothermal processes. Numerical on above gas processes .Reversible Adiabatic process, presentation on p-v, T-S plane, Analysis for Heat transfer, Work transfer, and change in Internal Energy, enthalpy and Entropy. Reversible Polytropic process, presentation on p-v, T-S plane, Analysis for Heat transfer, Work transfer, and change in Internal Energy, enthalpy and Entropy. Numerical on above gas processes..

Properties of Steam

Pure substance, Phases of pure substances, Phase change diagrams for water substance at standard atmospheric pressure, sensible heat and latent heat of steam. Terminology: dry, superheated, wet steam, saturation temperature, critical point and triple point, use of steam table. Measurement of dryness fraction by using separating and throttling calorimeter, Numerical, Vapor processes- sketch on P-V, T-S, H-S diagrams, analysis for property changes, heat and work transfer. Numerical on steam processes.

Text Books:

1. Engineering thermodynamics, 3rd edition, Tata McGraw-Hill Education, 2005
2. Thermodynamics, C P Arora, 12th edition Tata McGraw Hill 2007.

References Book:

1. Fundamentals of classical thermodynamics, G J Van Wylen, Richard E Sonntag; latest edition Wiley publication 2013.
2. Engineering thermodynamics, Y V C Rao, 4th edition, Universities Press 2008.
3. Engineering thermodynamics, J B Jones and R E Dugan, 2nd edition, PHI, publication 2009.
4. Thermodynamics, Yunus Cengel and M A Boles, 6th Edition, Tata McGraw Hill 2010
5. Basic Thermodynamics by Dr. Ganesan, 4th edition, Tata McGraw Hill, 2014.

ME 203 - MANUFACTURING ENGINEERING

Teaching Scheme: 03L, Total: 03 **Credit: 03**
Evaluation Scheme: 15 ISE1 +15 ISE2 + 10 ISA + 60 ESE **Total Marks: 100**
Duration of ESE: 03Hrs

COURSE DESCRIPTION:

This course provides the basic knowledge of manufacturing processes. Course includes fundamentals of casting processes, metal forming & forging processes, Welding and joining processes, Metal removing processes, plastics and their processing.

DESIRABLE AWARENESS/SKILLS:

Fundamental knowledge of tool, materials and measurement techniques.

COURSE OBJECTIVE:

The prime objective of offering this course is to familiarize with,

1. Understand various pattern making tools and processes.
2. To know various moulding processes and tools.
3. Understand fundamental concept of plastic manufacturing processes
4. Understand various forming processes, Metal removal and joining processes

COURSE OUTCOMES:

On completion of this course; student shall be able to,

1. To design the patterns and moulds for various Mechanical Engineering applications.
2. Understand the basics of Metal removing, Metal Forming and Joining processes
3. Understand the concept of plastic processing.

RELEVANCE OF COS / POS AND STRENGTH OF CO- RELATION:

PO/CO	CO-1	CO-2	CO-3
PO-b	3	3	3
PO-c	3	3	3
PO-g	1	1	3
PO-j	2	2	2
PO-l	2	2	2

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT:

Introduction

Manufacturing – definition, classification of manufacturing processes.

Pattern Making

Pattern materials, allowances, Types of patterns, Pattern Making Introduction, pattern making tools, sawing tools, making and layout tools, pattern materials, factors affecting selection of pattern materials, master patterns, pattern allowance, types of pattern, core print, core boxes.

Sand casting

Basic principle and Terminology of sand casting, gating system, types of gate ,Risers design, Risering aids, Directional and Progressive solidification. Analytical approach to riser design, General properties of moulding sand and core making. Sand mouding defects.

Special casting methods

Modernization and Mechanization of Foundries, permanent mold casting, slush casting, shell molding, Investment or lost wax casting, vacuum process, centrifugal casting, continuous casting, Die casting equipments and processes for Gravity, pressure and vacuum casting methods.

Metal Forming Processes: Introduction

Classification of deformation processes. Rolling Basic rolling processes, Hot and cold rolling processes, Rolling mill configuration, Principle of roll pass design, thread rolling. Forging: Open die and Close die forging, Hammer forging, Impression die, Press forging, Upset forging, Roll forging. Extrusion methods, Metal flow in extrusion, Extrusion of hollow shape, Hydrostatic extrusion, Continuous extrusion. Wire, Rod and Tube drawing.

Joining processes

Introduction to riveting, soldering, brazing and welding. Gas welding, working principle and its application, Arc welding: arc initiation, arc maintenance, and arc control, transfer of metal across the gap, Electrode efficiency, Types and purpose of Electrodes, TIG welding: working principle and its application, MIG- welding: working principle and its application. SAW - welding: working principle and its application, Resistance welding: - Working principle and its applications. Other welding processes: Working principle and applications of Friction Welding, Forge Welding, Plasma arc, and Thermit Welding. Ultrasonic, Electro slag, Electron Beam, laser welding. Introduction, weldability, types of welding, newer welding methods.

Plastics and their Processing

Introduction, polymers, classification, polymer additives, cellulose derivatives, synthetic resins, elastomer, plastic processing methods, forming methods, lamination of plastics, joining of plastics Processing of plastics: Compression, Transfer, Injection, Extrusion. Blow moulding, Rotational moulding and calendaring.

Metal Removing Processes

Lathe machine, Introduction to machine tools- Principal parts of lathe machines (Tailstock, Head stock, Carriage, Bed) Lathe specification, Cutting speed, Feed, Depth of cut, Machining time. Lathe Machine operations: Facing, Turning, Boring, Parting, Drilling, Reaming, Knurling, and Capstan and turret lathe-

Tool layout for simple jobs. Milling machine, Milling machine operations, types of milling cutters, table feed in Milling. Drilling Machine Operations, Drilling, Boring, Reaming, Spot facing, counter boring, counter sinking, Tapping, Drill speed and feed, Grinding wheel, Selection and specifications, Dressing and truing of grinding wheels.

Text Books:

1. Manufacturing Engineering, M.S. Mahajan, edition 2008, Dhanpat Rai and sons, Delhi.
2. Production Technology, P C Sharma, Khanna Publications, New Delhi. 2001, ISBN8121904218
3. Metrology and Quality Control, M.S. Mahajan, edition 2008, Dhanpat Rai and sons, Delhi.
4. Element of Workshop Technology, Hajara Chaudhary and Bose S K, 2nd edition Volume I and II, Asia Publishing House, Bombay,1999.

Reference Books:

1. Materials and Processes in Manufacturing, DeGarmo, Black Konser, Wiley; 11th edition, 2011.
2. Introduction to Manufacturing processes, Schey J. A., 3rd edition, Tata McGraw Hill, 1999.
3. Processes and Materials of Manufacturing, Lindberg A., 4th edition, Prentice Hall, 1998.
4. Workshop Technology, Vol. I Raghuvanshi B.S., 10th Edition, Dhanpat Rai and sons, Delhi, 2013.
5. Elements of Workshop Technology, Vol. I Hazra Choudhary, edition 2009, Media Promoters
6. Production Technology, Jain R.K., Khanna publication, 2014.
7. Workshop Technology, Vol. II Bawa H.S., 1st Edition, Tata McGraw Hill, 1995.

CE 221 - STRENGTH OF MATERIALS

Teaching Scheme: 03L, Total: 03 **Credit : 03**
Evaluation Scheme: 15 ISE1+15 ISE2+10 ISA+ 60ESE **Total marks : 100**
Duration of ESE: 3 Hrs.

COURSE DESCRIPTION:

This course introduces undergraduate students about Strength of materials. This course includes fundamentals of stress-strain and their relation, various forms of stresses, concept of SFD and BMD, simple bending & its stress distribution, basics for column & struts, Euler's and Rankine theory, twining of shaft, principle stress-strain, Mohr's circle, , stress –strain energy and theory of torsion of shaft.

DESIRABLE AWARENESS/SKILLS:

The background required includes a sound knowledge of Mathematics (Calculus), Engineering Mechanics and Physics of first year Level.

COURSE OBJECTIVE:

The prime objective of offering this course is to familiarize with,

1. To know the behaviour of material at various in compression and tension
2. Understand and analyze shear force and bending moment in various loading conditions
3. To know the phenomenon of bending of different sections and its analysis and recognize Principle Stresses
4. To understands various columns sections and geometrical analysis
5. Concepts of strain energy, torsion and numerical analysis

COURSE OUTCOMES:

On completion of this course; student shall be able to:

1. To apply compression and tension test results to understand stress, strain, young's modulus etc.
2. To develop SFD and BMD for various conditions
3. To apply the knowledge of bending concept to determine various stresses
4. Enhance the knowledge of columns conditions and develop numerical ability
5. Apply use of strain energy in failure modes of material

RELEVANCE OF COS / POS AND STRENGTH OF CO- RELATION:

PO/CO	CO-1	CO-2	CO-3	CO-4	CO-5
PO-a	3	3	3	3	3
PO-g	3	3	3	3	3
PO-h	3	3	3	3	2
PO-j	2	2	3	2	2

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Introductory of strength of materials

Simple Stresses and Strains: stress and strain and its various types, stress-strain diagrams and their characteristics for mild steel, TOR steel, Elasticity, Stress, Strain, Hook's Law, Young's Modulus, factor of safety, numerical on stresses in bar of varying sections and composite bars, numerical on statically indeterminate problems, thermal stresses and strains, numerical on thermal stresses in bars of varying sections and composite bars numerical, numerical on elastic constants, bulk modulus, shear modulus, relation between bulk modulus, shear modulus and Young's modulus.

Concept of Shear Force and Bending Moment Diagrams

Different types of beams, different types of supports & loads, Concept and definition of shear force and Bending Moment in beams due to concentrated load, UDL, uniformly varying loads and couples in determinate beams. Relationship between SF, BM and intensity of loading, construction of SF and BM diagrams for cantilevers, Simple compound beams and bend. (Numerical are on all above topics of this context).

Theory of Simple Bending

Theory of simple bending, concept and assumptions, Derivation of Flexure formula, defining critical and maximum value and position of point of contra flexure. Bending stress distribution diagram, Moment of resistance and section modules calculations.

Shear and Bending Stress distribution

Area centre and moment of inertia of common cross section (regular section, T-section, channel section, I-section) with respect to centroidal and parallel axis, bending stress distribution diagram, moment of resistance and section modulus calculations. Direct and bending stresses in short column with eccentric point loads, concept of core section, middle third rule. Shear stresses: - Concept, derivation of shear stress distribution formula, shear stress distribution diagram for common cross section, maximum and average shear stresses (Numerical are on all above topics of this context).

Columns and Struts Strength

Columns & Struts: Euler's theory and Rankin's theory of column failure with different support conditions, derivations, radius of gyration, slenderness ratio, factor of safety, numerical on single and built up cross sections. Slope & deflection of beams: Slope & deflection in statically determinate beams subjected to point loads, uniformly distributed loads, moments by Macaulay's method, Moment Area method and Conjugate Beam method. (Numerical are on all above topics of this context).

Principle Stress- Strain and Strain Energy

Introduction to Normal and shear stress on any oblique plane, concept of principle plane. Derivation of expression for principle stresses and planes and plane of max. Shear stress, position of principle plane and plane of max. Shear, Graphical solution using Mohr's circle of stresses. Combined effect of shear and bending in beams. Strain energy and impact-concept of stain energy, derivation and use of expression for deformation of axially loaded members under gradual, sudden and impact loads. Strain energy due to self-weight. (Numerical are on all above topics of this context).

Twisting of Shaft

Theory of torsion of shafts of circular, cross section. Assumptions, Derivation of torsion formulae, stresses strains and deformation in determinate and indeterminate shafts of hollow, solid, homogeneous and composite circular cross section subjected to twisting moments, stresses due to combine torsion, bending and axial force on shafts. (Numerical are on all above topics of this context).

Text Books:

1. Strength of Materials, S. Ramamurtham & R. Narayanan &, 18th Edition, Dhanpat Rai Publishing Company (P) Limited
2. Strength of Materials, I.B.Prasad, Khanna publication, 2000
3. Strength of Material, Paytal and Singer, 4th edition, Harper Collins publications
4. Strength of Material, B.C.Punmia, 9th Edition Vol.1, Standard publisher and distributors

Reference Book:

1. Mechanics of Materials, Gere. James M. & S. Timoshenko, Indian Reprint ,CBS Publisher & Distributor, New Delhi 1985
2. Mechanics of Structure, Dr. H. J. Shah and S. B. Junnarkar, 30th Edition ,Charotar Publication House, ANAND,2012.
3. Mechanics of Materials, by Beer, Johnston and DeWolf, 3rd edition, Tata McGraw Hill Publication, New Delhi, 2002
4. Strength of Materials, Ferdinand Beer and Jr., E. Russell Johnston, 6th Edition, Tata McGraw Hill, New Delhi, 2008
5. Theory and Problems of Strength of Materials, William A. Nash, 3rd Edition, Schaum's Outline Series, McGraw Hill International Editions, 1994.

SH 204 GENERAL PROFICEINCY-II

Teaching Schemes: 01 L + 02PR; Total: 03 **Credits: 02**
Evaluation Scheme: 25 ICA + 25 ESE **Total Marks: 50**

COURSE DESCRIPTION:

This course is mainly designed to inculcate human skills among students community. It includes both soft skill development and human behavior at work. The student will learn the speaking, listening, drafting and presentation skills. Student will study the organization of meeting, GD/PI principles, general etiquettes & manners and organizational communication. This course will help to develop thinking ability, positive attitude, leadership ability, emotional competence and to perform well under varied circumstances.

DESIRABLE AWARENESS/SKILLS:

Basic principles of communication and English as a language.

COURSE OBJECTIVES:

The objectives of offering this course are
1. to strengthen the persona of student.
2. to learn use of concepts and applications of ICT based presentation skills.
3. to sharpen the soft skills to enhance employability.

COURSE OUTCOMES:

On completion of this course; student shall be able to:
1. apply basic knowledge of public speaking, listening and presentation skills
2. draft a document and write a technical/non-technical report.
3. demonstrate good etiquettes and manners in his/her life and face GD/PI confidently.
4. understand the organizational human behavior
5. use ICT based presentation.

RELEVANCE OF POS AND STRENGTH OF CO-RELATION:

PO/CO	CO-1	CO-2	CO-3	CO-4	CO-5
PO-a	3	3	3	3	3
PO-d	3	3	3	3	3
PO-g	2	3	3	3	1

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT:

Organizational Communication:

Overview: Meaning, definition, classification, purpose and importance of communication; communication structure in organization, communication in conflict, crisis and cross-cultural setting; oral communication, reflection and empathy: two sides of effective oral communication; general etiquettes and manners; significance of body language in communication and assertiveness training.

Written Communication: Purpose of writing, clarity in writing, principles of effective writing, the 3x3 writing process for business communication, pre writing, writing, revising, specific writing features – coherence; technical report writing (IEEE standards).

Business Letters and Reports: Types of business letters, writing routine and persuasive letters, positive and negative messages; writing reports - purpose, kinds and objectives of reports; organization and preparing reports, short and long reports; writing proposals: structure & preparation; writing memos.

Group Communication: Meetings- planning, objectives, participants, timing, venue of meetings; meeting documentation: notice, agenda, agenda notes, book of enclosures and resolution & minutes of meeting.

Presentation skills: Elements of presentation – designing and delivering business presentations, advanced technological support for presentation, computer based power point presentation.

***Employment communication*:** Introduction, Composing Application, Writing CVs, Group discussions, Interview skills, do's and don'ts at GD/PI; technology-enabled communication - communication networks, intranet, internet, videoconferencing.

Organizational Behavior

Overview: Definition, historical development, fundamental principles of OB, contributing disciplines, challenges and opportunities.

Individual Behavior: Foundations of individual behavior. Ability: Intellectual abilities, Physical ability, the role of disabilities.

Personality: Meaning, formation, determinants, traits of personality, big five and MBTI, personality attributes influencing OB.

Attitude and Perception: Formation and components of attitudes, positive attitude, impact of attitude on behavior and decision making**.** Process of perception, factors influencing perception, link between perception and individual behavior/decision making.

Emotions: Affect, mood and emotion and their significance, basic emotions, emotional intelligence, emotional quotient, emotion management at individual and group level.

Motivation: Meaning and significance; theories of motivation-needs theory, two factor theory; application of motivational theories.

Leadership: Meaning, functions and styles of leadership; leadership theories - trait theory, behavioral theories,, path goal theory, charismatic leadership theory, situational theories-Fiedler's model; transactional and transformation leadership.

***Group Behavior*:** Definition, types, formation of groups, building effective teams; conflict**:** meaning, nature, types, process of conflict, conflict resolution.

Topics for Assignment /Practical

Minimum ten number of assignments/practical shall be performed to cover entire curriculum of the course. The list given below is just a guideline.

1. Speech preparation and delivery,
2. Power point presentation on general topics/ latest trends,
3. Preparation of meeting agenda/ conducting meeting / taking minutes of meeting,

4. Demonstration of general etiquettes and manners through role playing,
5. Demonstration of attitude/leadership etc through role playing,
6. Conducting mock meeting and preparing related documents,
7. Writing application letter along with resume,
8. Reporting positive and negative information to seniors,
9. Preparing notice/ circular/ memo/ enquiries/ quotations,
10. Conducting group discussions and personnel interview,
11. Report writing/Paper presentation,
12. Drafting policies/ procedures/ rules,
13. Sharing experience to motivate others or to demonstrate mood /emotion and their significance,
14. Determination of emotion quotient/Intelligent quotient and personality analysis.

Text Books:

1. Business Communication for Managers, Penrose, Rasberry, Myers, 5th edition, Cenage Learning, 2007
2. Business Communication, Rai and Rai, 2nd edition, Himalaya Publishing House, 2014
3. Organization Behaviour, Suja R. Nair, Himalaya Publications, 2014
4. Organization Behaviour, V. S. P. Rao, 1st edition, Excel Publications, 2009

Reference Books:

1. Business Communication, Raman and Singh, 2nd edition, Oxford Publication, 2012
2. Business Communication Today, Bovee, Thill, 6th edition, Schatzman, Pearson Education, 2000
3. Business Communication (BCOM), Lehman Sinha, 2nd edition, Cengage Learning, 2012
4. Organization Behavior, Stephen P. Robbins, 13th edition, Pearson Education, 2009
5. Organization Behavior, Fred Luthans, 12th edition, TMH, 2012
6. Organization Behavior, K. Ashwathappa, 7th edition, Himalaya Publications, 2007

Note:

- **ICA –** Internal Continuous Assessment shall support for regular performance of practical/assignments and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student based on practical/assignments performed/completed by him/her. The performance shall be assessed experiment/assignment wise using internal continuous assessment format (S 10).
- **ESE –** The End Semester Exam for this course shall be based on one or more parameters among performance/oral examination/assignment etc to judge the skills acquired by student. It shall be evaluated by two examiners out of which one examiner shall be out of institute.

ME 204 - FLUID MECHANICS LAB

Teaching Scheme: 02P, Total: 02 **Credit: 01**
Evaluation Scheme: 25ICA + 25 ESE **Total Marks: 50**

Minimum Ten experiments shall be performed to cover entire curriculum of course ME201.

List of Experiments:

1. Experiment on determination of metacentric height of a floating body,
2. Experiment on verification of Bernoulli's theorem,
3. Study of manometers,
4. Determination of Viscosity by using Red wood viscometer,
5. Experiment on Reynolds's apparatus,
6. Experiment on flow measurement by using Orifice meter,
7. Experiment on flow measurement by using Venturi meter,
8. Trial on centrifugal pumps,
9. Experiment on determination of major and minor losses for flow through pipe,
10. Study of sharp edged circular orifice / mouthpieces,
11. Study of velocity distribution in boundary layer and its thickness.

Guide lines for ICA:

Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (Journal And sheet) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format **(S 10).**

Guide Lines for ESE:

Oral will be based on content of syllabus and practical.

ME205 - ENGINEERING THERMODYNAMICS LAB

Teaching Scheme:-02P, Total: 02 **Credit : 01**
Evaluation Scheme: 25 ICA+25 ESE **Total Marks : 50**

Minimum Six experiments and five assignments shall be performed to cover entire curriculum of course ME 202

List of Experiments:

1. Study of Boiler and Boiler Mountings,
2. Study of Boiler Accessories,
3. Study of Babcock and Wilcox Boiler,
4. Study of Cochran and Lancashire Boiler,
5. Study of Vapour compression Cycles,
6. Visit to Thermal Power plant,
7. Calculation of COP of refrigerating cycle (House hold refrigerator),
8. Numerical assignment on each topic,

Guide lines for ICA:

Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (Journal And sheet) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format **(S 10).**

Guide Lines for ESE:

Oral will be based on content of syllabus and practical.

ME 206 - WORKSHOP PRACTICE-III

Teaching Scheme: 02P, Total: 02 **Credit :01**
Evaluation Scheme: 50 ICA **Total Marks: 50**

Internal Continuous assessment consist of following the performance of practicals,

1. **Turning Shop**: Study of different operations to be carried on the lathe machine, taper turning methods (calculations), single point cutting tool operations, external threading, facing, finishing cuts
   Job: Preparing a job on lathe machine performing the above operations

2**. Pattern Making** Shop: Study of pattern materials, types of patterns and cores, allowances, pattern making tools and allowances parting line of multi piece patterns etc.

   Job: Preparing at least one pattern in wood, involving details like, allowances, core prints.

3**. Foundry Shop**: Sand moulding, types of sands, preparing sand for moulding, equipments, sand moulds (cope, drag, check etc.).

4. **Welding Shop:**
   Different welding machines and equipments, types of welding and welded joints, used in fabrication, preparation for weld joints, joint finishing, safety precautions, different tools, types of electrodes, angle cutters, portable grinder, drills etc.

   Job: Preparing a job individually or in a group of students of any useful item of daily use using welding operations.

Guide lines for ICA:
Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (Journal and Jobs) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format **(S 10).**

Text Book:

1. Manufacturing Engineering, M.S. Mahajan, 1 st edition, , Dhanpat Rai and sons, Delhi, 2008.
2. Metrology and Quality Control, M.S. Mahajan, 2 nd edition, , Dhanpat Rai and sons, Delhi, 2008.

Reference Books:

1. Element of Workshop Technology, Hajara Chaudhary and Bose S K, 2nd Edition Volume I and II, Asia Publishing House, Bombay, 2001.
2. Production Technology, P. N. Rao, Volume I and II", Tata McGraw Hill Publication, New Delhi, 2001.
3. Production Technology, P C Sharma, Khanna Publications, 2014.
4. Production Technology, R K Jain, Khanna Publication, 2014.
5. Workshop Technology, W.A.J. Chapman, ELBS Low Price Text, Edward Donald Pub. Ltd.
6. Production Technology, Chapman W A J, HMT Tata McGraw Hill Publication, 2001
7. Workshop Manual, Kannaiah K L, Narayana, Chennai, 2nd Edition Scitech Publications, 1998.

CE 222 – STRENGTH OF MATERIALS LAB

Teaching Scheme: 02P, Total: 02 **Credit : 01**
Evaluation Scheme: 50 ICA, **Total marks : 50**

Minimum five experiments and five assignments shall be performed to cover entire curriculum of course CE 221

List of Experiments

1. Tension test on mild steel
2. Shear test on metals
3 Impact test on metals
4. Hardness test on metals
5. Torsion test on solid shafts.
6. Numerical assignment on each topic.

Guide lines for ICA:

Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (Journal) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format **(S 10).**

GOVERNMENT COLLEGE OF ENGINEERING, JALGAON.

Department of (Mechanical Engineering).

Scheme for B. Tech. (Mechanical Engineering)

SEM IV

Course Code	Name of the Course	Group	Teaching Scheme Hrs /week				Evaluation Scheme							Credits
							Theory				Practical		Total	
			TH	TUT	PR	Total	ISA	ISE1	ISE2	ESE	ICA	ESE		
EE 271	Electrical Machines & Drives	B	3	---	---	3	10	15	15	60	---	---	100	3
ME251	Theory of Machine-I	D	3	---	---	3	10	15	15	60	---	---	100	3
ME252	Advance Manufacturing Processes	D	3	---	---	3	10	15	15	60	---	---	100	3
ME253	Applied Thermodynamics	D	3	---	---	3	10	15	15	60	---	---	100	3
ME254	Machine Drawing	D	3	---	---	3	10	15	15	60	---	---	100	3
ME255	Computer Graphics	D	1	---	2	3	---	---	---	---	50	50	100	2
EE 272	Electrical Machines & Drives Lab	B	---	---	2	2	---	---	---	---	25	25	50	1
ME256	Theory of Machine - I Lab	D	---	---	2	2	---	---	---	---	25	25	50	1
ME257	Workshop Practice – IV	D	---	---	2	2	---	---	---	---	50	--	50	1
ME258	Applied Thermodynamics Lab	D	---	---	2	2	---	---	---	---	25	25	50	1
ME259	Machine Drawing Lab	D	---	---	4	4	---	---	---	---	25	25	50	2
		Total	**16**	**0**	**14**	**30**	**50**	**75**	**75**	**300**	**200**	**150**	**850**	**23**

TH: Theory Lecture, TUT: Tutorial, PR: Practical

ISA :Internal Sessional Assessment ISE : In Semester Examination ESE: End Semester Examination ICA : Internal Continuous Assessment

EE 271 –ELECTRICAL MACHINES & DRIVES

Teaching scheme: **03L, Total : 03** **Credit : 03**
Evaluation Scheme : 15 ISE1, 15 ISE2+10 ISA+60 ESE **Total Mark :100**
Duration of ESE: 3 Hrs.

COURSE DESCRIPTION:

This course provides the elementary level knowledge of Basic Electrical Drives & Controls. Course includes introduction to Electric power measurement, Electric Energy measurement, Illumination DC Machines. The course also introduces students to concept of Single phase & three phase transformers & Three Phase Induction Motor, Single phase Induction motors & Synchronous Generator, Special purpose machines, Sensors, Robotics, DAS and Relays.

DESIRABLE AWARENESS/SKILLS:

Fundamental knowledge of Physics and Basic Electrical.

COURSE OBJECTIVE:

The prime objective of offering this course is to familiarize with,

1. Fundamental concepts, principles of electrical machines.
2. Basic knowledge and to develop practical skills to solve engineering problems of all machines

COURSE OUTCOMES:

On completion of this course; student shall be able to:

1. Learn basic concepts of DC machines and AC machines
2. Develop practical skills through different test, applications of DC machines and AC machines

RELEVANCE OF COS / POS AND STRENGTH OF CO- RELATION:

PO/CO	CO-1	CO-2
PO-a	**3**	1
PO-b	2	1
PO-c	1	3
PO-g	1	1

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Introduction to Power, Energy and Illumination

Measurement of active & reactive power using one wattmeter, two wattmeter & three wattmeter method, Effect of load power factor on power measurement, Measurement of electrical energy, 1 phase & 3 phase Energy meter construction and operation / working, Illumination – various terms in illumination, laws of illuminations types of illumination, lighting schemes, Good lighting scheme, flood lighting, special purpose lighting,

D.C. Machines

Construction & working, D.C. Generators – EMF equation, types of D. C generator, their characteristics working, application, D.C. Motors - construction and working, back EMF equation, torque equation, types of d.c. motors & their characteristics applications, D.C. Motors - starters, types, various methods of speed control,

Transformers

Principle, working classification of transformer, EMF equation, losses & efficiency, condition for maximum efficiency, 3 phase transformer connections – types, merits & demerits (star. Star, Star - delta, delta –star, delta-delta, V-V, Scott connection)

A.C. Machines

Alternators – types, principle, working construction, EMF equation (various factors in it), alternator on load synchronous reactance, phasor diagrams, Voltage regulation of alternator – by direct loading, Amp-Turn (synchronous impedance) method, MMF method, Motors – types 1ø, 3ø construction, principle & working, slip RMF & torque equation slip characteristics, power stages, starters - necessity, types, merits, demerits & applications "V" curves, hunting Special purpose machines, sensors, relays, robotics & Data Acquisition system, Sensors- Proximity, Block diagram, working, application of light, ultrasonic, hall effect, Relays – electromechanical, solid state, latching on delay off delay, Stepper motors & servomotors Robotics D. A. S.

Text Books:

1. A text of Electrical Technology vol. I & II, B. L. Theraja & A. K. Theraja S. Chand, 1st Edition, 2001.
2. Electrical machines D P Kothari and I J Nagrath, 3rd Edition, Tata McGraw Hill,

Reference Book

1. Fundamental of Electrical Engineering, Ashfaq Husain, 3rd Edition, Dhanpat Rai & Co. 2002
2. Control of Machines, S. K. Bhattacharya, 2nd Edition, Reprint 2013. New Age International (P) Ltd., Publishers, New Delhi
3. Electrical and Electronic Technology, Hughes Edward , 4th Edition, Pearson Education India, 2010

ME251- THEORY OF MACHINE - I

Teaching Scheme : 03L, Total :03 **Credit : 03**
Evaluation Scheme : 15 ISE1+ 15 ISE2+ 10 ISA+ 60 ESE **Total Marks :100**
Duration of ESE : 3 Hrs

COURSE DESCRIPTION:

This course provides the elementary level knowledge of Theory of Machines. Course includes introduction to kinematics of machines and mechanisms, various methods of velocity and acceleration analysis of plane mechanisms. Friction and friction devices are also included in the syllabus. One unit on belt, rope and chain drives cover the necessary details of these power transmitting devices.

DESIRABLE AWARENESS/SKILLS:

Fundamental knowledge of Physics, Mathematics and Engineering Graphics.

COURSE OBJECTIVE:

The prime objective of offering this course is to familiarize with,

1. Develop concepts of kinematic, kinematics links and its applications in various mechanisms use in practice and Knowledge of different relative motions of machine components,
2. Understand and develop concept of relative and instantaneous velocity, develop mathematical ability of solving practical problem with selecting appropriate method for analysis,
3. Understand concept of radial and tangential acceleration and its analysis,
4. Recognize the use of various cam mechanisms, motions and accelerations, identify, formulate and solve problems based on cam,
5. Understand the terminology of gears and its concepts, identify, formulate and solve problems based for various Parameters of gears.

COURSE OUTCOMES:

On completion of this course; student shall be able to:

1. Apply the fundamental concepts of kinematic, kinematics links and its applications in various mechanisms use in practice and able to decide feasibility of mechanism
2. Use and apply the knowledge of relative and instantaneous velocity, develop ability to formulate and solve problems based on above in practice and able to analyze designed mechanism
3. Apply knowledge of radial and tangential acceleration to solve the practical problems based on mechanisms and its analysis
4. Acquire knowledge of cam mechanisms, its motions and accelerations and develop analytical ability to solve practical problems
5. Apply knowledge of gears, gearing action in practice for developing the gear train.

RELEVANCE OF COS / POS AND STRENGTH OF CO- RELATION:

PO/CO	CO-1	CO-2	CO-3	CO-4	CO-5
PO-b	3	3	3	3	3
PO-h	3	3	3	3	3

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Simple Mechanism

Introduction, Kinematics, Kinetics, Static & Dynamics, Machine, Kinematic Link or element, Type of links, Structure, Difference between a Machine and a Structure, Types of Constrained Motions, Classification of Kinematic Pairs. Kinematic Chain, Types of joints in a Chain, Types of Kinematic Chains, Mechanisms, Number of Degrees of Freedom for Plane Mechanisms, Application of Kutzbach Criterion to Plane Mechanisms, Grubler's Criterion For Plane Mechanisms, Inversion of Mechanism, Four Bar Chain, Single Slider Crank Chain, Inversion of Double Slider Crank Chain (no numerical treatment), Mechanism with lower pairs.

Velocity in Mechanism

Introduction, Relative & Absolute velocity, Velocity of a point on a link by Instantaneous Centre of Rotation (ICR) method, Properties of ICR, Location Of ICRs, Space and Body Centrodes Kennedy's or Three Centre in Line Theorem, ICR , method for different Mechanisms Relative Velocity Method, Relative Velocity of Two Bodies Moving in Straight Lines, Motion of a Link, Velocity of a point on a Link by Relative Velocity Method, Velocities in a Four bar mechanism, Slider Crank Mechanism & other inversions, Rubbing velocity at a Pin Joint, Mechanical advantage.

Acceleration in Mechanisms

Introduction to Linear, Angular, Centripetal Tangential acceleration, Acceleration Diagram for a Link, Acceleration of a Point on a Link Acceleration in the four bar Mechanisms, Acceleration in the Slider Crank Mechanism and other inversions Introduction to Coriolis Component of Acceleration, magnitude and Direction, Coriolis Component of Acceleration for different mechanisms Klien's construction different cases of slider crank mechanisms.

Friction

Introduction, Types of Friction, Friction Between Lubricated Surfaces, Limiting Friction, Laws of solid Friction, Laws of Fluid Friction, Coefficient of Friction, Limiting Angle of Friction, Angle of Repose, Friction of a Body Lying on a Rough Inclined Plane, Efficiency of Inclined Plane Screw friction, Terminology of screw, Screw Jack, Torque requirements, Efficiency, Friction of a V-thread

Friction in Journal Bearing- Friction Circle, Friction of Pivot and Collar Bearing, Flat pivot Bearing, Conical Pivot Bearing, Trapezoidal or Truncated Conical Pivot Bearing, Flat Collar Bearing Friction Clutches, Single Disc or Plate Clutch, Multiple Disc Clutch, Cone Clutch, Centrifugal Clutch.

Belt, Rope and Chain Drives

Introduction, Selection of a Belt Drive, Types of Belt Drives, Types of Belts, Material used for Belts. Types of Flat Belt Drives, Velocity Ratio, Slip of Belt, Creep of Belt Length of an Open Belt Drive and Cross Belt Drive, Power Transmitted, Ratio of Driving Transmission of Maximum Power, Initial tension V-Belt drive, Advantages and Disadvantages, Driving Tensions for V-Belt, Rope Drives & Chain Drives, Kinematic of Chain Drive, Classification, Advantages and Disadvantages, Terminology, Chain Speed and Angular Velocity of Sprocket, Length of Chain.

Static and Dynamic Force Analysis

Synthesis of mechanism, Introduction, D' Alembert's principle Velocity and Acceleration by analytical method (I.C engine mechanism only), Static Force Analysis of slider crank mechanism, Inertia of Rigid bodies (Compound pendulum, bifilar suspension, trifillar suspension), Dynamic Equivalent system of compound pendulum (Analytical Method).

Text Books:

1. Theory of Machines, S.S.Rattan, IInd Edition Tata McGraw Hill, New Delhi, 2000.
2. Theory of Mechanisms & machines, Ballaney 21st Edition. Kh pub Publication, 1998.
3. Theory of Machines by Dr. R.K. Bansal 5th Edition. Laxmi Publications (P) Ltd., 2002.
4. Theory of Machines by Sadhu Singh 3rd Edition Pearson Publication, 1995.

Reference Books:

1. Theory of Machines and Mechanisms, Shigley, J.E. and Uicker, J.J. 4th Edition Mc Graw Hill International Book co., 2001.
2. Mechanisms and Machines theory, Rao J.S and Dukkipati R.V. 2nd Edition, Wiley Eastern Ltd, New Delhi, 2002.
3. Theory of Mechanisms' & machines, Amitabh Ghosh, 3rd Edition, East West Press, New Delhi, 2002.
4. Theory of Machines by Thomas Bevan 3rd Edition. CBS Publisher, Delhi.
5. Theory of Mechanisms' & machines, Jagdish Lal, 1st Edition, Metropolitan Book Co., Hyderabad, 1997.

ME 252 – ADVANCE MANUFACTURING PROCESSES

Teaching Scheme: 03L, **Credit: 03**
Evaluation Scheme: 15 ISE1 +15 ISE2 + 10 ISA + 60 ESE **Total Marks: 100**
Duration of ESE: 03Hrs

COURSE DESCRIPTION:

This course provides the basic knowledge of Advance manufacturing processes. Course includes fundamentals of metal cutting, Design of jigs and fixtures, Sheet metal working, Gear manufacturing and CNC machine, Unconventional machining processes.

DESIRABLE AWARENESS/SKILLS:

Fundamental knowledge of Engineering Graphics and conventional machining processes.

COURSE OBJECTIVE:

The prime objective of offering this course is to familiarize with,

1. To understand terminology and Tools Engineering.
2. To understand operations carried out on gear manufacturing and broaching machines
3. To understand operations carried out on grinding machines
4. To understand various non traditional machining processes

COURSE OUTCOMES:

On completion of this course; student shall be able to:

1. Select the correct tool for the particular machining operation.
2. The knowledge of indexing process on milling machine for gear cutting
3. Design the jigs and fixtures and press tools.
4. Acquire the knowledge of grinding operations and Broaching operation.
5. Understand practical aspects of non traditional machining

RELEVANCE OF COS / POS AND STRENGTH OF CO- RELATION:

PO/CO	CO-1	CO-2	CO-3	CO-4	CO-5
PO-b	3	3	2	3	2
PO-c	3	3	3	3	1
PO-e	3	3	3	3	1
PO-g	1	1	2	3	1
PO-l	1	1	3	1	1

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Theory of Metal cutting

Mechanics of Metal cutting, Cutting parameters, chip formation & types, Machining forces and merchants force circle diagram. Tool materials, Tool Geometry, Tool life, Tool wear types, Cutting forces and power consumption, economics of metal cutting, Cutting fluid classification.

Jigs And Fixtures

Introduction to jigs and fixtures, Need of jigs and fixtures, Elements of jigs and fixtures, Design principle Design principle of jigs and fixture, Principle of location, Locating devices, Clamping Principle of clamping, Types of clamp, Drill bushes, Drill bushes Types, Applications, Indexing devices, Types of jigs, Milling fixture Types of Milling fixture (plain string, gang and indexing), Types of turning fixtures.

Sheet Metal Working

Introduction to press tools, Elementary treatment of press working, Operation on presses, Press devices and classification of presses, Design of dies Design of blanking, Piercing, compound, progressive, bending, forming, and drawing dies, Load calculations, Selection of die and presses, Development of blanks, scrap strip layout, Design of punches, Selection of die sets, stock guides, strippers, pilots, stops, etc, selection of presses, capacities and other details.

Broaching, Gear manufacturing and super finishing processes

Broaching: Introduction, Working principle, classification, mechanical construction, Gear Manufacturing: Gear cutting process - Forming and generations, Gear cutting, Milling, Hobbing, Gear Shaping, Shaving, lapping, Grinding. Super finishing Process: Honning, lapping, burnishing and buffing processes with its working principle, advantages and disadvantages with its applications.

Unconventional Machining Processes

Ultra sonic machining- principle and applications process parameters, abrasive and water abrasive jet machining, Mechanism of metal removal parameters involved. Electron beam machining- Generation of beam principle and applications, Laser beam machining applications, Plasma arc machining, concept and generation of plasma, principle of PAM, applications, Electrochemical machining Classifications, fundamentals, Electromechanical milling. Electric discharge machining Wire EDM, Mechanism of material removal, process parameters, advantages and applications.

Text Books:

1. Manufacturing Engineering, M.S. Mahajan, edition 2008, Dhanpat Rai and sons, Delhi.
2. Manufacturing Technology-I &II, P C Sharma, edition 2008, S.Chand Publications
3. Element of Workshop Technology, Hajara Chaudhary and Bose S K, Volume I & II, edition 1997 Asia Publishing House.

Reference Books:

1. Materials and Processes in Manufacturing, DeGarmo, Black Kosher, edition 2005, Prentice Hall of India.
2. Manufacturing Science, Amitabh Ghosh, Asok Kumar Malik, edition 2006, EWP Affiliated East-West Private Limited.
3. Manufacturing Technology, P N Rao Vo I & II, edition 2009, Tata McGraw Hill Publication
4. Manufacturing Processes -I &II, Bawa H.S, edition 2004, Tata McGraw Hill Publication
5. Jigs and Fixtures, P H Joshi, 1 st edition, Tata McGraw Hill Publication, 2001.

ME 253 – APPLIED THERMODYNAMICS

Teaching Scheme: 03L, Total: 03 **Credit: 03**
Evaluation Scheme: 15 ISE1+15 ISE2+10 ISA+ 60ESE **Total marks: 100**
Duration of ESE : 3 Hrs

COURSE DESCRIPTION:

This course imparts knowledge of Applied Thermodynamics. This course includes boiler and its performance, its classification, vapour power cycle, Nozzle & Diffuser, Compressor, construction and working of Centrifugal & Axial flow fans.

DESIRABLE AWARENESS/SKILLS:

Fundamental knowledge of Physics and Engineering Thermodynamics.

COURSE OBJECTIVES:

The prime objective of offering this course is to familiarize with,

1. Understand ingof various real-life applications of basic Thermodynamics including Reciprocating and rotary air compressors, Boilers, Steam power plants, etc.
2. Knowledge of compressible flow, steam nozzles and diffusers.

COURSE OUTCOMES:

On completion of this course; student shall be able to:

1. Understand working of boilers & Boiler and Boiler Performance.
.2 U ndersthnd and analyseVapor Power Cycle.
.3 Understand working .and calculate condeser perfomance
.4 Understand working of rotory and reciprocating air compressors.

RELEVANCE OF COS /POS AND STRENGTH OF CO-RELATION:

PO/CO	CO-1	CO-2	CO-3	CO-4
PO-b	3	3	3	3
PO-c	3	3	3	3
PO-e	3	3	3	3
PO-g	2	2	3	3

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Boiler and Boiler Performance

Steam Power Plant layout, Classification and selection of boilers, Stocker Fired boiler, and Modern boilers with various fossil fuels, IBR act, Energy conservation Opportunities, and waste heat recovery boiler. Boiler performance - Equivalent evaporation, boiler efficiency (direct and Indirect Method), Numerical on boiler performance, Heat balance for a boiler, Numerical on boiler Heat balance, Boiler Draught, Natural & Artificial draught, losses, Condition for Maximum discharge through Chimney, Numerical on draught.

Vapor Power Cycle and Steam Condenser

Fundamentals of Vapor Processes, Steam power cycles- Carnot Cycle, Rankine cycle, Analysis of Rankine cycle for work ratio, efficiency, Power output, specific Steam consumption, Heat rate, Comparison of Rankine and Carnot cycle, Numerical on Rankine cycle, Methods to improve Rankine cycle efficiency - Regeneration, Reheating, Cogeneration. (Elementary treatment)Numerical on reheat Rankine cycle, regenerative Rankine cycle, Condenser, classification of condenser, Necessity of condenser, Condenser efficiency, Vacuum efficiency, Air leakage and its effect on condenser performance, Air extraction pump, Cooling towers,

Compressible Flow and Steam Nozzle

Compressible fluid flow, Static and Stagnation properties, numerical, Sonic velocity, Mach number, type of nozzles and diffusers, One dimensional steady isentropic flow through nozzles and diffusers, Critical pressure ratio, Maximum discharge, choked flow, Numerical on flow through nozzles and diffusers, Effect of variation in back pressure on nozzle characteristics, Effect of Friction and nozzle Efficiency, Numerical on Effect of friction and nozzle Efficiency.

Reciprocating Air Compressor

Introduction, use of compressed air, terminology used in compressor, Classification of compressors. Construction and working of single stage compressor, Thermodynamic analysis of reciprocating air compressor without clearance volume, Isothermal Efficiency, Double acting Compressor, Numerical of reciprocating air compressor without clearance, Effect of clearance, analysis of reciprocating air compressor with clearance Volume, volumetric Efficiency, FAD, Actual Indicator diagram, Numerical of reciprocating air compressor with clearance, Improvements in volumetric efficiency, multistage compression, Condition for minimum work of compression, Intercooler, after cooler, heat rejected. Numerical on reciprocating air compressor.

Rotary air Compressor

Introduction, classification of rotary compressors; construction, working, Analysis and application of roots blower, Construction, working, analysis and application of vane type compressor, Construction, working, analysis and application of screw type compressor, Introduction, classification of fans and blowers, Fan characteristics, Construction and working of centrifugal fan and axial flow fan, Numerical only on fan.

Text Books:

1. Thermal Engineering, R. K. Rajput, 9th Edition, Laxmi Publication New Delhi, 2013.
2. Engineering Thermodynamics, P. K. Nag, 5th Edition, Tata McGraw Hill, 2013.
3. Power Plant Engineering, P K Nag, 4th Edition, Tata McGraw Hill, 2014.

Reference Books:

1. Thermodynamics: an Engineering Approach, Y. A. Cengel and M A Boles, 7th Edition Tata Mc Graw Hill, 2011.
2. Applied Thermodynamics for Engineering Technologists, T. D. Eastop and Mc Conkey, 5th Edition, Pearson Education India, Reprint 2013.
3. Power Plant Technology, M. M. El-Wakil, 1st Edition, Tata McGraw Hill, 2011.
4. Steam & Gas Turbines & Power Plant Engineering, R. Yadav, 7th Edition, Central Publishing House, Allahabad, 2011.
5. Course in Thermal Engineering, C. P. Kothandaraman, Domkundwar, Domkundwar S, Dhanpat Rai & Company (P) Limited, 2013.

ME254 - MACHINE DRAWING

Teaching Scheme: 03L, Total: 03 **Credit : 03**
Evaluation Scheme: 15 ISE1+15 ISE2+10 ISA+ 60ESE **Total marks : 100**
Duration of ESE: 04 Hrs.

COURSE DESCRIPTION:

This course provides the elementary level knowledge of Machine Drawing. Course includes introduction to machine drawing, dimensioning, elements of production drawing, and types of fits, surface roughness, and conventional representation of machine components, riveted joints and welded joints. The course also introduces students to study sequences of preparing the assembly drawing and bill of materials.

DESIRABLE AWARENESS/SKILLS:

Fundamental knowledge of Engineering Graphics.

COURSE OBJECTIVES:

The prime objective of offering this course is to familiarize with,

1. To understand the intersection curves for joining the surfaces
2. To apply fundamental tolerances appropriately for various Mechanical Engg. applications.
3. To understand various developed surfaces and solids of mechanical component/ product for manufacturing
4. To know various types of standard parts with its specifications and their practical application

COURSE OUTCOMES:

On completion of this course; student shall be able to:

1. Draft the intersection of curves for sheet metal work
2. Apply concept of standard conventional Symbols and feasibility in Mechanical engineering applications
3. draft assembly and detailing the various machine components with proper notation of tolerances and all standard mechanical symbols.
4. Decision making about to suitable relevance standard parts application in practice

RELEVANCE OF COS /POS AND STRENGTH OF CO-RELATION:

PO/CO	CO-1	CO-2	CO-3	CO-4
PO-b	3	3	3	3
PO-c	3	3	3	3
PO-e	3	3	3	3
PO-g	2	2	3	3

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Intersection of Surfaces

Line or Curve of intersection of two solids, Methods: Line method, Cutting-plane method. Intersection of vertical prism with prism, cylinder, cone (Horizontal or Inclined), Intersection of vertical Cylinder with cylinder, cone, prism (Horizontal or Inclined), Intersection of vertical cone with cone, prism, cylinder (Horizontal or Inclined), Intersection of Sphere with cylinder, prism (Horizontal or Inclined), Application of intersection of surfaces - revolved surfaces, forged parts, machine parts, roof tops

Introduction to Machine Drawing

Conventional (Machining) lay symbols of various machining processes, conventional representation of materials and machining symbols, Surface Textures, Roughness values and Roughness Grades, Machining symbols Conventional Representation on part drawings.

Limits, Fits and Tolerances:

ISO system of tolerance, Tolerance charts, Hole - base and shaft -base system of tolerance,

Types of fits, symbols and its applications, Geometric Tolerances: Introduction, Nomenclature, Rules, Symbols, values obtained from various manufacturing processes.

Representation of standard components

Screw fasteners, various types of keys, different kinds of couplings, bearings, pulleys, brackets, gears, locking arrangements, Rivets and riveted joints, Welding symbols. Pipe Joints: - Expansion joints, stuffing box and glands, piping layouts, conventional, Representation of pipe fittings, valves, joints, etc.

Preparation of Detailed drawing from given Assembly drawing & vice-versa:

Engine parts: Stuffing box, cross head, Connecting Rod End, Eccentric *Machine Tool parts & Accessories*: Single Tool Post, Square Tool Post, Clapper Block, Shaper Tool Head, Lathe Tail Stock, Milling Machine Tail Stock, Revolving Centre, Machine Vice, Swivel Machine Vice, Drill Jig, Indexing Drill jig, *Valves & Boiler Mounting*: Gate Valve, Non Return Valve, Blow off Cock, Feed Check Valve, Lever Safety Valve, Ramsbottom Safety Valve *Miscellaneous Parts*: Plummer Block, Swivel Bearing, C – clamp, Crane Hook, Pipe Vice.

Text Books:

1. Machine drawing, N. D. Bhatt, 38th edition, Charotar Publisher, 2003.
2. Machine Drawing, N. Sidheshwar, Shastry, Kannaiah, 4thedition, Tata Mc Graw Hill, 1996 and 2005.

Reference Books:

1. Machine Drawing, Narayana, K.L.Reddy, 2nd edition, New AGE International Publishers, 2004.
2. Machine Drawing, P.J.Shah, 3rd edition, Shah Publishers, 1997.
3. Machine Drawing, R. K. Dhawan, 1 st Revised edition, S. Chand Publication, 2011.
4. Machine Drawing, R.K.Dhawan, 4th edition, S. Chand& Co. Delhi, 2006.
5. Machine Drawing, Basudeb Bhattacharya, 2nd edition, Oxford Higher Education Publication, Noida U.P., 2012.
6. Machine Drawing – P.S Gill, 7th edition, S. K. Kataria publication, New Delhi, 2012.

ME 255 - COMPUTER GRAPHICS

Teaching Scheme: 01L+ 02 P, Total: 03 **Credits: 02**
Evaluation Scheme: 50 ICA + 50 ESE **Total Marks: 100**
Duration of ESE: 03Hrs

Course Description:
This course introduces the student to CAD tool of engineering science. The student will learn to the use of computer systems to assist in the creation, modification, analysis, or optimization of a design & manufacturing using CAD packages like CATIA, Creo-Parametric, and AutoCAD. Students will learn about of these CAD packages and also learn how they are useful for them to develop visualization skills.

Desirable awareness/skills:
Knowledge of Engineering Graphics and Machine Drawing.

Course Objectives:
The prime objective of offering this course is to familiarize with,
1. To develop the technical skills necessary to generate an engineering drawing and an engineering assembly using a modern CAD system
2. To focusing on 3D modelling of simple assembly drawings and prepare detailed part drawings with geometric Dimensioning and tolerance.
3. To introduce the elements of engineering communications; including graphical representation of Machines end its elements.

Course Outcomes:
On completion of this course; student shall be able to:
1. Apply various concepts of engineering graphics like dimensioning, conventions and standards related to Machine Drawings in order to become professionally efficient.
2. Read and interpret assembly drawings with moderate complexity
3. Effectively use CAD software to produce the drawing of Machine components as required.
4. Develop visualization skill and hand on developing the new products.

Relevance of COs /POs and strength of co-relation:

PO/CO	**CO-1**	**CO-2**	**CO-3**	**CO-4**
PO-a	3	2	2	3
PO-b	2	3	2	1
PO-c	1	3	2	1
PO-h	3	2	1	3
PO-l	3	2	1	3
PO-m	2	2	3	3

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT:

Introduction to CAD Software:

Introduction to solid modelling, Graphical User Interface (GUI) of any commercially used latest CAD software like AutoCAD, Creo-Parametric, CATIA, Application of CAD, Industrial importance, Difference between conventional drafting methods and CAD

Details of 2D Drawing:

Details of various menu bars and toolbars, drawing area, basics commands like line, circle, arc, rectangle, text, boundary hatching, ellipse, polygon, etc. Modify toolbar- Dimension toolbar –Properties toolbar – layer toolbar, importing and exporting layer toolbar, Image -importing, saving. Isometric snap- ISO circle (ellipse), angle setting keys for ISO. Script generation for 2D stimulation. Settings- snap grid, parameter, print and plot etc.

Parametric solid modelling – fundamentals apply/modify constraints and dimensions; transform the parametric 2-D sketch into 3D solid, feature operations. Free form feature modelling, design by features, feature recognition.

Assembly modelling – defining relationship between various parts of machine, creation of constraints, generation of exploded view.

Geometric dimensioning and tolerances - Introduction to GD&T, straightness, perpendicularity, flatness, angularity, roundness, concentricity, cylindricity, runout, profile, true position, parallelism, orientation.

ICA Performance:

Internal continuous assessment consist of performance of following practical

1) Minimum two 2D sketch of details and assembly of machine components (such as Cotter joint, Knuckle joint, Plummer block, Oldham coupling etc.) using AutoCAD software. And one sketch of Isometric drawing.
2) Minimum two parametric solid modelling of a machine component using various commands and features of the software.
3) Assignment on solid modelling of the parts of a machine (min. 5 components).
4) Assignment on assembly modelling of the parts modelled in assignment 3 using proper mating conditions and generation of exploded view.

ICA examination:

The internal continuous assessment shall be based on practical record and knowledge / skills acquired. The performance shall be assessed experiment wise by using continuous assessment formats, 1 to 4.

ESE Examination:

1. Practical examination duration is **three hours**, based on the ICA, and should contain two sessions as follows:
   Session-I: Preparation of 3-D models of parts, assembling parts and preparing views of Assembly from given 2-D detailed drawing.
   Session-II: Preparation of minimum five detailed 3-D part drawings from given 2-D Assembly drawing.
   Note: - *Oral examination should also be conducted to check the knowledge of conventional and CAD drawing.*
2. Questions provided for practical examination should contain minimum five and not more than ten parts.
3. The distribution of marks for practical examination shall be as follows:

   Session-I …… 20 marks

Session-II ……20 marks
Oral …….....10 marks

4. Evaluation of practical examination to be done based on the printout of students work
5. Students work along with evaluation report to be preserved till the next examination.

Text books:

1. A text book of Machine Drawing and Computer Graphics by Farazdak Haideri, Nirali Prakashan, Pune, 1998.
2. AUTOCAD, S. Vishal, edition 2nd, Dhanpat Rai publication, New Delhi, 2012.
3. A text Book of Machine Drawing, R. K. Dhawan, 1st edition, New Delhi, 2011.

Reference Books:

1. Machine Drawing, N. D. Bhatt and V.M. Panchal, 19th Edition, Charoter Publications, 2012 Mastering CAD/CAM by Zeid Ibrahim, Special Indian edition, Tata McGraw Hill, New Delhi, 2007.
2. A text book of Engineering Graphics using AutoCAD by T. Jeyapoovan, 3rd edition, Vikas Publication House Pvt. Ltd, Noida, 2008.
3. A text book of Engineering Drawing and Graphics + AutoCAD by K. Venugopal, 4th edition, New Age International publishers, New Delhi, 2005.

EE 272 – ELECTRICAL MACHINES AND DRIVES LAB

Teaching Scheme: 02P, Total: 02 **Credit: 01**
Evaluation Scheme: 25ICA + 25 ESE **Total Marks: 50**

Minimum Ten experiments shall be performed to cover entire curriculum of course EE271,

1. Speed control of DC Shunt motor by armature control and flux control methods.
2. Load test on DC Shunt Motor.
3. Load test on DC Series Motor.
4. Measurement of active power in a three phase balanced inductive load using two Wattmeter Methods.
5. No load & full load test on transformer to find efficiency & regulation
6. Regulation of an alternator by Direct Loading method.
7. Load Test on three Phase Induction Motor
8. Study of D.C. Motor Starters & Three Phase Induction Motor Starter.
9. Study of speed control ac servo motor
10. To study speed control of universal motor.
11. To perform load test on single phase motor
12. Study of robotic sensors & relays.

Guide lines for ICA:

Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (Journal and sheet) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format **(S 10).**

Guide Lines for ESE:

Oral will be based on content of syllabus and practical

ME256 - THEORY OF MACHINE-I LAB

Teaching Scheme: - 02P, Total : 02 **Credit : 01**
Evaluation Scheme: 25 ICA+25 ESE **Total Marks : 50**

Minimum Six experiments and five assignments shall be performed to cover entire curriculum of course ME 251

List is Experiments:

1. Study of Mechanisms & their inversions
2. To determine mass Moment Inertia of compound pendulum
3. To determine mass Moment Inertia bifilar/ trifillar Suspension method
4. Determination of Relative Velocity & acceleration by graphical method
5. Velocity analysis by ICR method.
6. Study of various parts of single plate & multiple plates clutches.
7. Study of Belts & pulleys.
8. Determine the velocity and acceleration by Klien's construction method.

Guide lines for ICA:

Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (Journal And sheet) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format **(S 10).**

Guide Lines for ESE:

Oral will be based on content of syllabus and practical.

ME 257 - WORKSHOP PRACTICE-IV

Teaching Scheme: 02P, Total: 02 **Credit: 01**
Evaluation Scheme: 50 ICA **Total Marks: 50**

Internal continuous assessment consist of performance of following practicals,

1. **Machine Shop**: Study and demonstration of different operations to be carried on the milling machine, lathe, Shaper, drilling & grinding machines. One composite job on shaper, milling, drilling, grinding machine, Indexing, gear cutting, slot cutting, spline cutting etc .

2. Design and drawing:

a) Tool geometry of single point cutting tools.
b) Tool geometry of twist drill.
c) Tool geometry of plain Milling cutter.

3. CNC:

To study different elements of CNC machine, Classification of CNC and Programming of CNC. Write exercise on one program each for CNC lathe and CNC Milling.

4. Non-Conventional Machine:

To study different non- conventional machining processes. Write assignments on any four non-conventional machining processes.

5. An Industrial visit to observe CNC machine and Non-conventional machining processes.

Guide lines for ICA:

Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (Journal and Jobs) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format **(S 10).**

Text Book:

1. Manufacturing Engineering, M.S. Mahajan, edition 2008, Dhanpat Rai and sons, Delhi.
2. Metrology and Quality Control, M.S. Mahajan, edition 2008, Dhanpat Rai and sons, Delhi.

Reference Books:

1. Element of Workshop Technology, Hajara Chaudhary and Bose S K, Volume I and II, 2nd, Edition, Asia Publishing House 1997.
2. Production Technology, P N Rao, Volume I and II, 3rd edition, Tata McGraw Hill Publication, 2009.
3. Production Technology, P C Sharma, 1 st edition S. Chand Publications 2007.
4. Workshop Practice, H S Bawa, 1st edition, Tata McGraw Hill Publication 2004.

ME 258 - APPLIED THERMODYNAMICS LAB

Teaching Scheme:-02P, Total: 02 **Credit : 01**
Evaluation Scheme: 25 ICA+25 ESE **Total Marks : 50**

Minimum Six experiments and five assignments shall be performed to cover entire curriculum of course ME 253

List of Experiments:

1. Determination of heating value of a solid / liquid fuel using Bomb Calorimeter.
2. Exhaust gas analysis using Gas Analyzer OR Orsat Apparatus.
3. Determination of Isothermal and Volumetric efficiency of reciprocating air compressor.
4. Study of High pressure boiler.
5. Study of Steam condensers and cooling towers.
6. Study of Steam Nozzles and diffusers.
7. Study of boiler draught.
8. Numerical assignment on each Unit. (Minimum 5 Problems)

Guide lines for ICA:

Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format **(S 10).**

Guide Lines for ESE:

Oral will be based on content of syllabus and practical.

ME259 - MACHINE DRAWING LAB

Teaching Scheme: 04P, Total: 04 **Credit : 02**
Evaluation Scheme: 25 ICA+25 ESE **Total marks : 50**

All five sheets shall be performed to cover entire curriculum of course ME 254
(All following sheets are mandatory).

1. One drawing sheet on Intersection of Surfaces
2. One drawing sheet on combined of introduction of machine drawing (consist various symbols) and limit, fit, tolerances symbols.
3. One drawing sheet on Presentation of standard components,
4. One drawing sheet on details of any one machine component's assembly.
   Note: - drawing sheet of above should consist of bill of material, Boolean, tolerance chart, Miscellaneous Symbols as per requirements,
5. One drawing sheet on Assembly of any one machine component's details
   Note: - drawing sheet of above should consist of all limit, fits, tolerances and GD & T with Machining symbols, Boolean, bill of materials

Guide lines for ICA:

Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (Sheet) based on practical performed by him/her. The performance shall be assessed practical sheet drawn using internal continuous assessment format (S 10).

Guide lines for ESE:

Oral will be base on the content of theory syllabus and practical / sheets.