ME201U-FLUID MECHANICS

Teaching Scheme: 03L **Credit: 03**
Evaluation Scheme: 30 MSE + 10 ISA + 60 ESE **Total Marks: 100**
Duration of ESE: 3 hours

COURSE DESCRIPTION

The students learning this course will understand the basic concepts of hydrostatics, buoyancy and flotation, kinematics and dynamics of fluid motion, dimensional analysis and boundary layer theory.

DESIRABLE AWARENESS/SKILLS:

Fundamental knowledge of mathematics and calculus
Fundamental knowledge of physics and chemistry and thermodynamics

COURSE OBJECTIVES:

The objectives of offering this course are to-

1. understand various properties of fluids.
2. learn fluid statics, kinematics and dynamics.
3. understand of boundary layer, drag, and lift.
4. understand of Bernoulli's equation and its practical applications.
5. understand and apply the theory of flow through pipes.

COURSE OUTCOMES:

On successful completion of this course, students will be able to-

1. use fluid properties in obtaining solution of processes / problems involving fluid flow.
2. demonstrate Bernoulli's equation for practical applications involving usage and design of venturimeter, orificemeter etc.
3. analyze the forces such as drag and lift on immersed bodies.
4. apply the principle of Dimensional Analysis to practical problems.

RELEVANCE OF COS AND POS AND STRENGTH OF CO-RELATION

CO/PO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	-	2	-	-	-	-	-	-	-	-	-	-	1	-	1
CO 2	1	2	1		-	-	-	-	-	-	-	-	2	-	2
CO 3	-	2	-	1	-	-	-	-	-	-	-	-	1	-	-
CO 4	-	2	-	-	-	-	-	-	-	-	-	-	-	-	1

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

COURSE CONTENT-

Fundamental Concepts of Fluid Mechanics

Definition of fluid, concept of continuum, density, specific weight, specific gravity, dynamic viscosity, kinematic viscosity, Newton's law of viscosity, types of fluid, rheological diagram, surface tension, capillarity, compressibility, vapour pressure.

Hydrostatics and Buoyancy and Flotation

Pascal's and hydrostatic law, total pressure and centre of pressure for vertical, horizontal inclined and curved surface, buoyancy and flotation, concept of metacentric height and equilibrium of floating and submerged bodies.

Kinematics of Fluid Motion

Eulerian and Langragian approach of fluid flow, continuity equation, types of flows (one dimensional, two dimensional, three dimensional, steady flow, unsteady flow, uniform and non-uniform fluid flow, laminar flow, turbulent flow, compressible flow, incompressible flow, rotational flow, irrotational fluid flow) fluid flow field (stream, path and streak line), vorticity in two dimensional flow, stream function and velocity potential function. (no numerical treatment for this chapter)

Dimensional Analysis

Dimensional Analysis: Dimensions of physical quantities, dimensional homogeneity, Buckingham π theorem and important dimensionless numbers.

Fluid Dynamics and flow through pipe

Introduction to Navier-Stokes' momentum equation, Euler equation of motion, derivation of Bernoulli's equation along stream line, concept of HGL and TEL, application of Bernoulli's equation to venture meter, pitot tube, orifice meter. Energy losses through pipe-major and minor losses, Darcy-Weisbach equation, pipes in series, pipes in parallel and concept of equivalent pipe, Moody's diagram, Siphons, transmission of power through pipes. (No derivations for minor losses)

Boundary Layer and External Flows

Boundary layer formation for flow over flat plate, boundary layer thickness (displacement, momentum and energy) Separation of boundary layer and methods of Controlling the forces on immersed bodies lift and drag (no derivation on lift), flow around cylinder and aerofoil.

Text books

1. Fluid Mechanics, Dr. R.K. Bansal- 9th edition, Laxmi Publication (P) Ltd. New Delhi,2014.
2. Hydraulics and Fluid Mechanics, Modi P. N. and Seth S. M, 19th edition-Standard Book House, 2012.
3. Fluid Mechanics, Cengel and Cimbla, 3rd edition, TATA McGraw-Hill,2019.
4. Fluid Mechanics, Frank M White, 7th edition, TATA McGraw-Hill,2011.

Reference Books

1. Fluid Mechanics, Kundu, Cohen, Dowling-6th edition- Elsevier India,2000.
2. Fluid Mechanics, Chaim Gutfinger, David Pnueli-1st edition,Cambridge University press,1997.
3. Introduction to Fluid Mechanics, Edward Shaughnessy, Ira Katz James Schaffer-1st edition, OXFORD University Press,2003.
4. Fundamentals of Fluid Mechanics- Munson, Okiishi, Huebsch, Rothmayer 7th edition, John Wiley & Sons Inc, 2004.

EE221U –ELECTRICAL MACHINES & DRIVES

Teaching scheme: 03L, **Credit: 03**
Evaluation Scheme: 30 MSE+10 ISA+60 ESE **Total Mark :100**
Duration of ESE: 03 Hrs.

COURSE DESCRIPTION:

This course provides the elementary level knowledge of basic electrical drives and controls. Course includes introduction to electric power measurement, electric energy measurement, illumination dc machines. The course also introduces students to concept of single phase and three phase transformers and three phase and single-phase induction motors and synchronous generator, special purpose machines, sensors and relays.

DESIRABLE AWARENESS/SKILLS:

Fundamental knowledge of physics and basic electrical.

COURSE OBJECTIVES:

The objectives of offering this course are to:
1. know fundamental concepts and principles of electrical machines.
2. develop practical skills to solve engineering problems of all machines
3. know the various tests on different machines
4. use sensors and relays for controlling various machines

COURSE OUTCOMES:

On successful completion of this course, students will be able to-
1. determine power/energy consumed by single and three phase circuits.
2. select proper DC and AC motors for industrial applications.
3. understand single phase and three phase transformer connections.
4. develop practical skills through different test, applications of DC machines and AC machines
5. use proper sensors and relays for industrial applications.

RELEVANCE OF COS AND POS AND STRENGTH OF CO-RELATION

CO/PO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	-	2	-	-	-	-	-	-	-	-	-	-	1	-	-
CO 2	-	3	-		-	-	-	-	-	-	-	-	-	-	-
CO 3	-	-	2	-	-	-	-	-	-	-	-	-	1	-	-
CO 4	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1
CO 5	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-

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, single phase & three phase energy meter construction and operation. Illumination – various terms in illumination, laws of illuminations, types of lighting schemes, good lighting scheme, flood lighting, special purpose lighting,

DC Machines: D.C. Generators - construction and working, Electro Magnetic Force (EMF) equation, types of D. C generators, characteristics working and applications. D.C. Motors - construction and working, back EMF, torque equation, types of D. C. motors and their characteristics, applications, D. C. Motor starters, various methods of speed control.

Transformers: Construction and principle of working, classification of transformers, EMF equation, losses & efficiency, condition for maximum efficiency, testing of transformer – direct and indirect loading test. Three phase transformer connections – types, merits and demerits (Star - Star, Star - Delta, Delta – Star, Delta - Delta connection)

AC Machines: Alternators – construction and working. EMF equation (various factors in it), alternator on load synchronous reactance, phase or diagrams, voltage regulation of alternator – by direct loading, AmpTurn (synchronous impedance) method, MMF method.

Three phase and single phase Induction Motors – types, construction, working principle, slip, torque equation slip characteristics, power stages, starters - necessity, types, merits, demerits & applications "V" curves, hunting

Special Purpose Machines and Sensors: Stepper motors and servomotors, BLDC motors. Sensors working and application - proximity switches, Hall effect, light detecting sensors, ultrasonic, thermal sensors. Relays–electromechanical, solid state, latching, ON delay and OFF delay, Data Acquisition Systems (DAS).

Text Books:

1. A Text of Electrical Technology vol. I & II, B. L. Theraja and 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

ME202U-THERMODYNAMICS

Teaching Scheme: 03L+01T **Credit: 04**
Evaluation Scheme: 30 MSE + 10 ISA + 60 ESE **Total Marks: 100**
Duration of ESE: 3 hours

COURSE DESCRIPTION

The course aims at imparting knowledge of basic thermodynamics. Course includes concept of Zeroth law, first law and its application, second law, carnot cycle, properties of steam, boiler and its performance, its classification, vapour power cycle and steam condenser, nozzle & diffuser, compressors.

DESIRABLE AWARENESS/SKILLS:

Fundamental knowledge of physics, chemistry and mathematics.

COURSE OBJECTIVES:

The objectives of offering this course are to gain-

1. knowledge of various laws of thermodynamics and applications to thermodynamic system, Steam properties, steam tables with numerical applications.
2. understanding of various real-life applications of basic thermodynamics including reciprocating and rotary air compressors, boilers, steam power plants etc.
3. knowledge of compressible flow, steam nozzles and diffusers.

COURSE OUTCOMES:

On successful completion of this course, students will be able to-

1. apply various laws of thermodynamics.
2. explain working of boilers and boiler performance.
3. analyze vapor power cycles and steam condensors.
4. analyze steam nozzle and diffusers.
5. describe construction, working of reciprocating and rotary compressors with performance calculations.

RELEVANCE OF COS AND POS AND STRENGTH OF CO-RELATION

CO/PO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO 2	3	-	2	-	-	-	-	-	-	-	-	-	1	-	-
CO 3	-	3	-	-	-	-	-	-	-	-	-	-	1	-	1
CO 4	-	2	-	-	-	-	-	-	-	-	-	-	1	-	1
CO 5	-	3	-	-	-	-	-	-	-	-	-	-	1	-	-

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

COURSE CONTENT

Laws of Thermodynamics

Introduction of thermodynamics, Zeroth law of thermodynamics, macro and microscopic approach, state, process and thermodynamic cycles, First law of thermodynamics, Joules experiment, steady flow energy equation and its application to different devices. PMM I, concept of reversibility and irreversibility, thermal reservoir, heat engine & its efficiency, refrigerator and heat pump, coefficient of performance, statements of Second law, PMM-II, Carnot cycle, Carnot theorem, entropy – introduction, entropy as property.

Properties of Steam and Boilers

Pure substance, phases of pure substances, sensible heat and latent heat of steam, use of steam table. Measurement of dryness fraction by using separating and throttling calorimeter, vapour processes-sketch on p-v, t-s, h-s diagrams .classification and selection of boilers, modern boilers, IBR act, boiler performance - equivalent evaporation, boiler efficiency, heat balance for a boiler, boiler draught.

Vapour Power Cycle and Steam Condenser

Steam power plant layout, Rankine cycle, analysis of Rankine cycle for work ratio, efficiency, power output, specific steam consumption, condenser, classification of condenser, necessity of condenser, condenser efficiency, vacuum efficiency, air leakage and its effect on condenser performance.

Steam Nozzle

Types of nozzles and diffusers, one dimensional steady isentropic flow through nozzles and diffusers, critical pressure ratio, maximum discharge, choked flow, effect of variation in back pressure on nozzle characteristics, effect of friction and nozzle efficiency.

Air compressors:

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, effect of clearance, analysis of reciprocating air compressor with clearance volume, volumetric efficiency, fad, actual indicator diagram. 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.

Text books

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

Reference books

1. Fundamentals of classical thermodynamics, G J Van Wylen, Richard E Sonntag; 6th 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. Basic Thermodynamics by Dr. Ganesan, 4th edition, Tata McGraw Hill,2018.
5. Thermodynamics: an Engineering Approach, Y. A. Cengel and M A Boles, 7th Edition Tata Mc Graw Hill, 2011.
6. Applied Thermodynamics for Engineering Technologists, T. D. Eastop and Mc Conkey, 5th edition, Pearson Education India, Reprint 2013.
7. Power Plant Technology, M. M. El-Wakil, 1st edition, Tata McGraw Hill, 2011.
8. Steam & Gas Turbines & Power Plant Engineering, R. Yadav, 7th edition, Central Publishing House, Allahabad, 2011.
9. Course in Thermal Engineering, C. P. Kothandaraman, Domkundwar, Domkundwar S, Dhanpat Rai & Company (P) Limited, reprint, 2016.

ME203U-MANUFACTURING PROCESSES

Teaching Scheme: 03L **Credit: 03**
Evaluation Scheme: 30 MSE+ 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 and forging processes, welding and joining processes, metal removing processes.

DESIRABLE AWARENESS/SKILLS:

Fundamental knowledge of tool, materials and measurement techniques.

COURSE OBJECTIVES:

The objectives of offering this course are to familiarize with:-

1. pattern making, mould preparation and casting processes.
2. various metal forming processes.
3. various joining processes.
4. various metal removal processes.

COURSE OUTCOMES:

On successful completion of this course, students will be able to-

1. design the patterns and moulds for various mechanical engineering applications.
2. explain metal removing process for particular application.
3. compare different metal forming process for particular application.
4. use proper joining processes for particular application.

Relevance of COs and POs and strength of co-relation

CO/PO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	1	1	-	2	-	-	-	-	-	-	1	-	1	-	1
CO 2	2	1	-	-	1	-	-	-	-	-	1	-	-	-	-
CO 3	1	-	-	1	1	-	-	-	-	-	-	-	-	-	-
CO 4	-	-	-	2	1	-	-	-	-	-	-	-	-	-	-

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

COURSE CONTENT:

Introduction

Manufacturing – definition, classification of manufacturing processes.

Sand Casting and Special Casting Methods

Basic principle and terminology of sand casting, pattern types of patterns, pattern materials, various allowances in pattern making, core print, core boxes, gating system, types of gate, risers design, rise ring aids, directional and progressive solidification, analytical approach for riser design, general properties of molding sand and core making, sand molding defects, permanent mould 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

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, types and purpose of electrodes, Tungsten Inert Gas (TIG) welding: working principle and its application, Metal Inert Gas (MIG) welding: working principle and its application, Submerged Arc Welding (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 and weld-ability.

Metal Removing Processes

Introduction to machine tool, lathe machine: - principal parts of lathe machines lathe specification. lathe machine operations: facing, turning, boring, parting, drilling, reaming, knurling, 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 Process: grinding machine, operation, grinding wheels, dressing and truing of grinding wheels, shaper and planer machine

Text Books:

1. Industrial engineering and Production Management , M.S. Mahajan, 1st edition, Dhanpat Rai and sons, Delhi, 2014.
2. Production Technology, P C Sharma, 8th Revised edition edition, Khanna Publications, New Delhi. 1999.
3. Element of Workshop Technology, Volume I and II ,Hajara Chaudhary and Bose S K, 2nd edition, Asia Publishing House, Bombay,1999.
4. Manufacturing Processes for Engineering Materials, Steven R. Schmid, Serope Kalpakjian, 5th edition, Pearson Publication, 2009.

Reference Books:

1. Materials and Processes in Manufacturing, DeGarmo, Black Konser, 11th edition, Wiley, 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, 2nd edition 2009, Media Promoters
6. Production Technology, Jain R.K., 17th edition, Khanna publication, 2014.
7. HMT Production Technology, Handbook,Tata McGraw Hill Publishing Co.1998

ME204U - STRENGTH OF MATERIALS

Teaching Scheme: 03L **Credit : 03**
Evaluation Scheme: 30MSE+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 Shear Force Diagram (SFD) and Bending Moment Diagram (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, engineering mechanics and physics of first year level.

COURSE OBJECTIVES:

The objectives of offering this course are to-

1. know the behavior of material at various in compression and tension.
2. understand and analyze shear force and bending moment in various loading conditions.
3. know the phenomenon of bending of different sections and its analysis and recognize principle stresses.
4. understands various columns sections and geometrical analysis.
5. concepts of strain energy, torsion and numerical analysis.

COURSE OUTCOMES:

On successful completion of this course, students will be able to-

1. apply compression and tension test results to understand stress, strain, Young's modulus etc.
2. develop SFD and BMD for various conditions
3. 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 AND POS AND STRENGTH OF CO-RELATION

CO/PO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	3	-	2	-	-	-	-	-	-	-	1	-	1	-	-
CO 2	-	-	3	-	-	-	-	-	-	-	-	-	-	1	-
CO 3	3	-	1	-	-	-	-	-	-	-	2	-	2	-	1
CO 4	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-
CO 5	3	-	2	-	-	-	-	-	-	-	1	-	-	-	1

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

COURSE CONTENT:

Introduction

Stresses and Strains: definition–stress, strain, Hooke's law, elastic limit, uni-axial, bi-axial and tri-axial stresses, tensile & compressive stresses, shear stress, principal stresses and strains, Mohr's circle, elastic constants: Poisson's ratio, modulus of elasticity, modulus of rigidity, bulk modulus, yield stress, ultimate stress, factor of safety, state of simple shear, relation between elastic constants, volumetric strain, volumetric strain for tri-axial loading, deformation of tapering members, deformation due to self –weight, bars of varying sections, composite sections, thermal stress and strain.

Shear Force and Bending Moment in Beams
Review of moment of inertia, axial force, shear force and bending moment diagrams for statically determinate beams including beams with internal hinges for different types of loading, relationship between rates of loading, shear force and bending moment.

Shear and Bending Stress distribution
Stresses in beams: theory of pure bending, assumptions, flexural formula for straight beams, moment of resistance, bending stress distribution, section modulus for different sections, beams for uniform strength, flitched beams, direct and bending stresses: core of sections, chimneys subjected to wind pressure, shear Stress in beams: distribution of shear stress across plane sections used commonly for structural purposes, shear connectors.

Torsion and Strain Energy
Torsion of circular shafts- solid and hollow, stresses in shafts when transmitting power, shafts in series and parallel, strain energy: resilience, proof resilience, strain energy stored in the member due to gradual, sudden and impact loads, Strain energy due to shear, bending and torsion.

Deflection of Beams and Columns and Struts:
Deflection of cantilever simply supported and overhangs beams using double integration and Macaulay's method for different types of loadings, columns and struts: buckling load, types of end conditions for column, Euler's column theory and its limitations, Rankine and Johnson formula.

Thin Cylindrical and Spherical Shells: Stresses in cylinders and spheres due to internal pressure, cylindrical shell with hemi spherical ends.

Text Books:

1. Strength of Materials, S. Ramamurtham & R. Narayanan &, 18th edition, Dhanpat Rai Publishing Company (P) Limited,2014.
2. Strength of Materials, I.B.Prasad, 2nd edition,Khanna publication, 2000.
3. Strength of Material, R.K.Bansal, 6th edition, Laxmi Publication,2018.
4. Strength of Material, B.C.Punmia, 9th edition Vol.1, Standard publisher and distributors,1988.
5. Strength of Material, R.K.Rajput, 6th edition,S.Chand Publication,2015

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

SH299U-EFFECTIVE TECHNICAL COMMUNICATION

Teaching Scheme: 00L+02PR **Credit: 01**

Evaluation Scheme: 25 ICA + 25 ESE **Total marks: 50**

COURSE DESCRIPTION:

The course is intended to provide basic technical communication to engineering students. This course introduces various engineering ethics as well as self development & assessment of the student.

DESIRABLE AWARENESS:

Basic knowledge of technical communication skill and engineering ethics

COURSE OBJECTIVES:

The objectives of offering this course are to-

1. identify and describe the basic communication process.
2. appreciate the value of empathic listening and effective feedback.
3. use technology appropriately to enhance communication success.
4. prepare and deliver an effective oral presentation.
5. understand the role of communication in personal & professional success.

COURSE OUTCOMES:

On successful completion of this course, students will be able to-

1. apply business communication strategies and principles to prepare effective communication for domestic and international business situations.
2. remember ethical, legal, cultural, and global issues affecting technical communication.
3. evaluate accurate business documents using computer technology.
4. apply an effective oral technical presentation.
5. define ethically use of document and integrate sources.

COURSE OUTCOMES (COS) AND PROGRAM OUTCOMES (POS) MAPPING WITH STRENGTH OF CO-RELATION

	PO												PSO		
CO/PO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	-	-	-	-	-	2	2	1	-	3	-	-			-
CO 2	-	-	-	-	-	2	2	1	-	3	-	-		-	-
CO 3	-	-	-	-	-	2	2	1	-	3	-	-			-
CO 4	-	-	-	-	-	2	2	1	-	3	-	-			-
CO 5	-	-	-	-	-	2	2	3	-	3	-	-		-	-

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

COURSE CONTENT:-

Introduction to Technical Communication:

Definition of technical communication, aspect of technical communication, forms of technical communication, importance of technical communication, technical communication skills (listening, speaking, reading, writing),linguistic ability, style in technical communication.

Nature of Technical Communication

Communication as sharing, stages of communication, channels of communication, nature of technical communication, aspects of technical communication, forms of technical communication, general and technical communication, importance and need for technical communication, technical communication skills: listening, speaking, reading, writing, barriers to effective communication.

Comprehension of Technical Material :(Information Design and Development)
Different kinds of technical documents, Information development life cycle, organization structures, factors affecting information and document design, strategies for organization, information design and writing for print and for online media

Technical Writing:
Grammar and Editing- technical writing process, forms of discourse, writing drafts and revising, collaborative writing, creating indexes, technical writing style and language, basics of grammar, study of advanced grammar, editing strategies to achieve appropriate technical style, introduction to advanced technical communication, usability, human factors, managing technical communication projects, time estimation, single sourcing, localization

Engineering Ethics:
Senses of engineering ethics, variety of moral issues, types of inquiry, moral dilemmas, moral autonomy, Kohlberg's theory, consensus and controversy, professional ideals and virtues, attributes of an ethical personality, theories about right action, self interest, responsibilities and rights of engineers, collegiality and loyalty, respect for authority, collective bargaining, confidentiality, conflict of interest, professional rights

Self Development and Assessment:
Self assessment, awareness, perception and attitude, values and beliefs, personal goal setting, career planning, self esteem, managing time, personal memory, rapid reading, taking notes, complex problem solving, creativity.

Text Books:

1. Effective Technical Communication By M Ashraf Rizvi, 2nd Edition, The McGraw Hill Publication, 2017.
2. Business Communication, Rai and Rai, 2nd edition, Himalaya Publishing House, 2014.
3. Organization Behavior, Suja R. Nair, 2nd Edition, Himalaya Publications, 2014.
4. Technical Communication: Principles And Practice, Meenakshi Raman, Sangeeta Sharma, 2nd Edition, 2012

Reference Books:

1. Goal Setting: How to Create an Action Plan and Achieve Your Goals, Susan Wilson, Michael Dobson.
2. Business Communication, Raman and Singh, 2nd edition, Oxford Publication, 2012.
3. Nonverbal Communication in Human Interaction by Mark L. Knapp, Judith A. Hall, Terrence G. Horgan.
4. Business Communication Today, Bovee, Thill, 6th edition, Schatzman, Pearson Education, 2000.
5. Business Communication (BCOM), Lehman Sinha, 2nd edition, Cengage Learning, 2012.

It is a representative list of practical. The instructor may choose experiments as per his requirements (so as to cover entire contents of the course) from the list or otherwise. Ten practical should be performed to cover entire curriculum of course SH299U. The list given below is just a guideline.

List of practical / assignments

1. Delivery of a speech on general topics by giving emphasis on non-verbal communication
2. Practical based on fourfold skills (Technical communication skills)
3. Delivery of a speech on technical topic
4. Role play on importance of time management
5. Performing a corporate meeting
6. Personal goal setting with priorities
7. Resume writing along with application letter
8. Group discussion
9. Personal interview
10. Debate on recent topics
11. Practical based on reading skills
12. Writing business letter
13. Role play on engineering ethics

Guidelines for ICA:

Internal Continuous Assessment should support for regular performance of practical by student and his/her regular assessment with proper understanding practical carried out.

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ME205U-FLUID MECHANICS LAB

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

COURSE OBJECTIVES:

The objectives of offering this course are to-

1. validate the various properties of fluids
2. understand the behavior of fluid statics, kinematics and dynamics
3. identify sources of major and minor losses and their effects on fluid flow
4. analyze various factors affecting fluid flow through pipes.

COURSE OUTCOMES:

On successful completion of this course, students will be able to-

1. explain the various properties of fluids and factors affecting them
2. design the applications involving usage of venturimeter, orificemeter etc.
3. analyze the forces such as drag and lift on immersed bodies such as aerofoil
4. describe stable, unstable, neutral equilibrium of floating bodies and apply the principles to real life problems.

RELEVANCE OF COS AND POS AND STRENGTH OF CO-RELATION

CO/PO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	1	1	-	-	-	-	-	-	-	-	-	-	1	-	-
CO 2	-	-	-	1	-	-	-	-	-	-	-	-	-	-	3
CO 3	-	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO 4	-	2	2	-	-	-	-	-	-	-	-	-	1	-	1

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

COURSE CONTENT

Minimum eight experiments and two assignments shall be performed to cover entire curriculum of course ME201U. The list given below is just a guideline.

1. Determination of metacentric height of a floating body.
2. Comparative study of different manometers.
3. Determination of viscosity of liquids and its variation with temperature.
4. Calibration of orifice meter/ venturimeter.
5. Determination of minor losses due to pipe fittings.
6. Determination of Major losses through pipes.
7. Experiment on Reynolds apparatus.
8. Simulation of velocity distribution in boundary layer over flat plate. (using simulation software)
9. Verification of Bernoulli's theorem.
10. Simulation of flow pattern around cylinder and aerofoil. (using simulation software)

Guidelines for ICA

Internal Continuous Assessment shall support for regular performance of practical and it's 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 approved internal continuous assessment format.

Guidelines for ESE

Oral will be based on content of syllabus and practical.

EE222U – ELECTRICAL MACHINES AND DRIVES LAB

Teaching Scheme: 02P **Credit: 01**

Evaluation Scheme: 25ICA + 25 ESE **Total Marks: 50**

COURSE OBJECTIVES:

The prime objective of offering this course is to:

1. develop practical skills to solve engineering problems of all machines.
2. know the efficiency and regulation by performing various tests on different machines.
3. control speed of motors
4. use sensors and relays for controlling various machines

COURSE OUTCOMES:

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

1. determine power and energy consumed by single and three phase circuits.
2. select proper DC and AC motors for industrial applications.
3. control the speed of various motors
4. develop practical skills through different test, applications of DC machines and AC machines
5. use sensors and relays for industrial applications.

RELEVANCE OF COS AND POS AND STRENGTH OF CO-RELATION

CO/PO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	-	2	1	-	-	-	1	-	-	-	-	-	1	-	-
CO 2	-	1	3		-	-	1	-	-	-	-	-	-	-	-
CO 3	-	-	-	-	2	-	-	-	-	-	-	-	1	-	-
CO 4	-	-	-	2	-	-	-	-	-	-	-	-	-	-	1
CO 5	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-

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

COURSE CONTENT

The laboratory work should consist of minimum 10 experiments based on theory syllabus of EE221U. the list given below is just a guide line.

List of Experiments:

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. OC and SC test on transformer to find efficiency and 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 starters.
9. Speed control of ac servo motor.
10. Speed control and reversal of rotation of universal motor.
11. To perform load test on single phase induction motor.
12. Study of sensors and relays.

Guide lines for ICA: It 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.

Guide Lines for ESE: Oral will be based on content of syllabus and practical.

ME206U-THERMODYNAMICS LAB

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

COURSE OBJECTIVES:

The objectives of offering this course are to-

1. understanding of basic principles, working of different components of steam boiler and boiler mountings, boiler accessories, nozzles and diffusers, steam condensers, air compressors.
2. apply knowledge of thermodynamics in various industries as required.

COURSE OUTCOMES:

On successful completion of this course, students will be able to-

1. describe the difference parameters of boiler performance and properties of steam.
2. explain the difference between different condensers.
3. analyze the Coefficient of Performance (COP) of refrigerator
4. analyze the working of nozzle and diffusers.
5. calculate efficiency of reciprocating air compressor.

RELEVANCE OF COS AND POS AND STRENGTH OF CO-RELATION

CO/PO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	-	3	-	-	-	2	-	-	-	-	-	-	1	-	1
CO 2	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO 3	-	3	2	-	-	-	-	-	-	-	-	-	1	-	1
CO 4	-	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	3	-	-	-	-	-	-	-	-	-	1	-	1

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

COURSE CONTENT

Minimum six experiments and five assignments shall be performed to cover entire curriculum of course ME202U. The list given below is just a guideline.

1. Demonstration of boiler and boiler mountings. (Using virtual lab)
2. Demonstration of boiler accessories .(Using virtual lab)
3. Demonstration of Babcock and Wilcox boiler.(using model)
4. Demonstration of Cochran and Lancashire boiler.(using model)
5. Visit to thermal power plant.
6. Calculation of COP of refrigerating cycle.
7. Demonstration of steam condensers .(Using virtual lab)
8. Analysis of flow through a nozzle and a diffuser. (Using virtual lab)
9. Demonstration of boiler draught.(Using virtual lab)
10. Determination of isothermal and volumetric efficiency of reciprocating air compressor.
11. Numerical assignment on each unit. (minimum 5 problems)

Guidelines 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).**

Guidelines for ESE

Oral will be based on content of syllabus and practical.

ME207U-WORKSHOP PRACTICE-III

Teaching Scheme: 02P **Credit :01**

Evaluation Scheme: 50 ICA **Total Marks: 50**

COURSE OBJECTIVE:

The objectives of offering this course is to familiarize with:-

1. pattern making, mould preparation and casting processes.
2. various taper turning methods.
3. various joining processes.
4. various Metal removal processes.

COURSE OUTCOMES:

On successful completion of this course, students will be able to-

1. design the patterns and moulds for various mechanical engineering applications.
2. explain metal removing process for particular application.
3. compare different metal forming process for particular application.
4. use proper joining processes for particular application.

RELEVANCE OF COS AND POS AND STRENGTH OF CO-RELATION

CO/PO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	1	-	-	2	-	-	-	-	-	-	1	-	1	-	1
CO 2	-	1	1	-	1	-	-	-	-	-	-	-	-	-	-
CO 3	1	1	2	-	1	-	-	-	-	-	-	-	-	-	-
CO 4	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-

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

COURSE CONTENT

Internal continuous assessment consist of following the performance of practical's,

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, equipment, 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.

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

SH200AU ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE

Teaching Scheme: 00L: **Credit: 00**
Evaluation Scheme: 60 ESE **Total Marks: 60**

COURSE DESCRIPTION:

This course is intended to provide basic understanding of Indian traditional knowledge. This course introduces students to the fundamental concept of basic & modern Indian knowledge system as well as Indian tradition.

DESIRABLE AWARENESS:

Basic structure of Indian knowledge system & various Indian traditions

COURSE OBJECTIVES:

Upon completion of this course, the student will be able to-

1. understand Indian knowledge system.
2. understand Indian perspective of modern scientific world view.
3. understand basic principles of yoga and holistic health care system.
4. develop ability to understand, connect up and explain basics of Indian traditional knowledge.
5. understand Indian philosophical tradition.

COURSE OUTCOMES:

Upon completion of this course, the student will be able to –

1. remember & apply Indian knowledge system in their personal as well as academic life.
2. apply Indian perspective of modern scientific world view.
3. analyzing basic principles of yoga and holistic health care system.
4. evaluate and explain basics of Indian traditional knowledge.
5. understand basic knowledge about Indian philosophical tradition.

RELEVANCE OF POS AND STRENGTH OF CORRELATION:

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	-	-	-	-	-	2	-	-	-	-	-	-	1	-	-
CO 2	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-
CO 3	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-
CO 4	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-
CO 5	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-

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

COURSE CONTENT:

Basic structure of Indian Knowledge System:

Ashtadashavidya –Types of vedas - rigveda, yajurveda ,samveda ,atharvveda, types of upaved- ayurveda ,dhanurveda ,gandharva veda ,stapatya veda, limbs of vedang, types of upanga

Modern Science and Indian Knowledge System: Logic, mathematics, phonetics, life sciences, physics, military science

Yoga and Holistic Care: General introduction to yoga, aims and objectives of yoga, psychological aspects and mythological concepts of yoga.

Philosophical Tradition (Sarvdarshan): Various Indian Philosophical Tradition (Heterodox): jain, buddhist, ajivika, ajnana, carvaka

Indian Linguistic Tradition: phonology, morphology, syntax, semantics

Indian Artistic Tradition: Understanding key terms in art appreciation: art, craft: Sculpture - iconography: hindu, buddhist and jaina ,modern sculpture.

Architecture - temple architecture -nagara, dravida and vesara ,mosques and mausoleums -tajmahal (any one)
Painting - mural painting – ajanta , mughal and rajput- miniature styles ,modern and contemporary artists
Music - traditional music**:** classical, folk, bhajan, thumri, dadra, sufi, modern music **:**bhangra, blues, dance, jazz, rock
Dance- classical, semi-classical, folk, tribal, shiva and natraja, bharatan atyam, kathak.

Text Book:

1. An Introduction to Indian Philosophy, S.C. Chaterjee & D.M. Datta, University of Calcutta, 1984.
2. Arts of India, Krishna Chaitanya, Abhinav Publications, 1987.
3. वासुदेवशरण अग्रवाल, कलाएवंसंस्कृत, साहित्य भवन, इलाहाबाद,1952.
4. Cultural Heritage of India-course material, Sivaramakrishnan (Ed.), Bharatiya Vidya Bhavan, Mumbai. 5th Edition, 2014.

References:

1. Foundations of Indian Art, R. Nagaswamy, Tamil Arts Academy, 2002.
2. The Wave of life, Fritz of Capra.
3. Ed. RN Jha, GN Jha (Eng. Trans.),Yoga-darshanam with Vyasa Bhashya, Vidyanidhi Prakashan, Delhi 2016
4. India Arts, Pramod Chandra, Howard Univ. Press, 1st Edition, 1983

SH 271U: ENGINEERING MATHEMATICS

Teaching Scheme : 03L+01T
Evaluation Scheme: 30 MSE +10 ISA +60 ESE **Credit: 04**
Duration of ESE : 03 Hrs **Total Marks: 100**

COURSE DESCRIPTION:

This course introduce the student to higher order differential equation, integral transforms, vector differentiation, statistics and probability use of these concept to solve real life problems.

DESIRABLE AWARENESS/SKILLS:

Basic of differential equation, statistic, vector and calculus.

COURSE OBJECTIVES:

The objectives of offering this course are to:

1. teach them to solve differential equation, use of integral transforms, and statistic.
2. equip the students with standard concept and tools at an intermediate.
3. advanced level that will serve them well towards lacking various problems in discipline.

COURSE OUTCOMES:

On the successful completion of this course, student will be able to -

1. solve differential equations and apply the knowledge to engineering problems
2. apply the idea of statistics, probability distribution, fourier transform problem analysis and solution.
3. apply the idea of integral transform for problem analysis and solution.
4. demonstrate the knowledge of partial differential equations and related concepts.
5. apply the idea of vector calculus for problem analysis and solution.

RELEVANCE OF POS AND STRENGTH OF CORRELATION:

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	1	-	-	-	-	-	-	-	-	-	1	-	-
CO 2	2	3	1	-	-	-	-	-	-	-	-	-	2	-	-
CO 3	2	3	1	-	-	-	-	-	-	-	-	-	-	-	1
CO 4	3	2	2	-	-	-	-	-	-	-	-	-	-	-	-
CO 5	3	1	-	-	-	-	-	-	-	-	-	-	1	-	-

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

COURSE CONTENTS

Higher Order Linear Differential Equations: n^{th} 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 one and two dimensional heat flow-Laplace equation, Numerical Methods for partial differential equation.

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, covariance, Karl Pearson coefficient of correlation, 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, 7^{th} edition, Pune Vidhyarthi Griha Prakashan, Pune, 2013.
2. A Text book of Engineering Mathematics, by N.P.Bali & Manish Goyal, 9^{th} edition, Laxmi Prakashan, 2014.

Reference books:

1. Advanced Engineering Mathematics by Erwin Kreyszig, 8^{th} edition ,Willey Eastern Ltd. Mumbai, 2013.
2. Higher Engineering Mathematics by B. S. Grewal, 33^{rd} edition , Khanna Publication, New Delhi, 1996.
3. Advanced Engineering Mathematics by H. K. Dass, 12^{th} edition, S. Chand Publication, New Delhi, 2003
4. Higher Engineering Mathematics by B. V. Ramana, 12^{th} edition , Tata McGraw Hill, Delhi, 2011.
5. Statistical methods by Dr. S.P.Gupta, 43^{rd} edition,.S.chand & Sons, Delhi, 2014.

ME251U-THEORY OF MACHINE - I

Teaching Scheme: 03L+01T **Credit: 04**
Evaluation Scheme: 30 MSE + 10 ISA + 60 ESE **Total Marks: 100**
Duration of ESE: 3 hours

COURSE DESCRIPTION

The students learning this course will understand the basic concepts of planar mechanism, kinematic analysis and synthesis of a planar mechanism, friction and friction devices, power transmitting devices and static force analysis of a mechanism.

DESIRABLE AWARENESS/SKILLS:

Fundamental knowledge of mathematics and calculus, physics and thermodynamics

COURSE OBJECTIVES:

The objectives of offering this course are to-

1. understand the concept of kinematics of a planar mechanism
2. learn kinematic analysis of a mechanism
3. understand kinematic synthesis of a mechanism
4. understand power transmitting drives and its practical applications
5. understand the concept of static force analysis.

COURSE OUTCOMES:

On the successful completion of this course, student will be able to –

1. use Grublers criterion to determine mobility of a mechanism, kinematic inversion of a mechanism and its application.
2. determine the velocity and acceleration of mechanism.
3. determine the principal dimension of a mechanism.
4. apply the principle of static force analysis to practical problems.

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

CO/PO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	3	2	1	1	-	1	-	-	-	-	-	-	1	-	-
CO 2	3	2	1	1	2	1	-	-	-	-	-	-	-	-	-
CO 3	3	2	1	1	2	1	-	-	-	-	-	-	-	-	-
CO 4	3	2	1	1	1	1	-	-	-	-	-	-	1	-	1

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

COURSE CONTENT

Planar Mechanism

Introduction, kinematics, kinetics, static & dynamics, machine, kinematic link or element, type of links, structure, types of motions, classification of kinematic pairs. kinematic chain, types of joints in a chain, types of kinematic chains, mechanisms, degrees of freedom for planar mechanisms, application of Kutzbach criterion to planar mechanisms, Grubler's criterion for

planar mechanisms, inversion of mechanism, four bar chain, single slider crank chain, inversion of double slider crank chain, mechanism with lower pairs.

Kinematic Analysis of Planar Mechanisms

Graphical method of velocity and acceleration analysis- relative velocity and relative acceleration method. Coriolis component of acceleration. introduction to instantaneous center method. Kennedy's theorem.

Kinematic Synthesis of a Mechanism

Introduction-synthesis, task of kinematic synthesis. concept of function generation, path generation, and motion generation problem, number synthesis, Freudenstein's equation, stages of kinematic synthesis and errors, Chebyshev spacing of precision points, graphical and analytical approaches for synthesis of a planar mechanism for three precision points only.

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 Force Analysis

Constraints and applied forces, static equilibrium, equilibrium of two and three-force members, member with two forces and torque, equilibrium of four- force members, force convection, free body diagrams, superposition, principle of virtual work, friction in mechanisms(analytical method).

Text Books

1. Theory of Machines, S.S.Rattan, 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. 2 nd 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.

ME252U – ADVANCED MANUFACTURING PROCESSES

Teaching Scheme: 03L, **Credit:03**

Evaluation Scheme: 30 MSE+ 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 principles of jigs and fixtures, sheet metal working, gear manufacturing, Computer Numerical Control (CNC) machine and unconventional machining processes.

DESIRABLE AWARENESS/SKILLS:

Fundamental knowledge of engineering graphics and conventional machining processes.

COURSE OBJECTIVE:

The objectives of offering this course are to-

1. understand metal cutting, terminology single point cutting tool and economics of metal cutting.
2. apply concept of additive manufacturing.
3. understand operations carried out while gear manufacturing, indexing and broaching machines.
4. understand surface finishing operations on grinding machines and wheel specifications.
5. learn various nontraditional machining processes and sheet metal working.
6. know basics and introduction to CNC machine programming.

COURSE OUTCOMES:

On the successful completion of this course, student will be able to –

1. explain the correct tool for the particular machining operation.
2. perform indexing on milling machine and operations for gear cutting process.
3. apply concept of additive manufacturing
4. choose an operation for the given surface finish.
5. apply practical aspects of nontraditional machining and CNC.

RELEVANCE OF COS AND POS AND STRENGTH OF CO-RELATION

CO/PO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	-	1	2	-	-	-	-	-	-	-	-	-	1	-	1
CO 2	1	1	-		1	-	-	-	-	-	-	-	-	-	1
CO 3	1	1	-	2	-	-	-	-	-	-	1	-	-	-	1
CO 4	-	1	1		-	-	-	-	-	-	-	-	-	2	-
CO 5	2	-	1		-	-	-	-	-	-	-	-	-	2	-

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 force sand power consumption, economics of metal cutting, cutting fluid classification.

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

Principle, Mechanism of material removal, process parameters, advantages, disadvantages, limitations and applications for following machining processes:Ultra Sonic Machining (USM), Abrasive and Water Abrasive Jet Machining (AWJM), Electron Beam Machining (EBM), Laser Beam Machining (LBM), Plasma Arc Machining (PAM), Electro-Chemical Machining (ECM), Electric Discharge Machining (EDM) Concept of additive manufacturing.

CNC Technology

Introduction and working of Numerical Control (NC), CNC, Distributed Numerical Control (DNC) machines. CNC axis and drives, introduction to automatic tool changer and automatic pallet changer, principles and block diagram of machining centers, advantages and applications.

Text Books:

1. Manufacturing Engineering, M.S. Mahajan, 3rd edition 2008, Dhanpat Rai and sons, Delhi.
2. Manufacturing Technology-I &II, P C Sharma, 2nd edition 2008, S.Chand Publications
3. Element of Workshop Technology, Hajara, Volume I & II, Chaudhary and Bose S K,, 1st edition Asia Publishing House, 1997.
4. Production Engineering, P. C. Sharma, 11th edition 2008, S Chand Publishers
5. Manufacturing Technology Vol I & II, P. N. Rao, 3rd edition Tata McGraw Hill Publishers.2013.

Reference Books:

1. Materials and Processes in Manufacturing, DeGarmo, Black Konser, 11th edition, Wiley,2011. or Materials and Processes in Manufacturing, DeGarmo, Black Kosher, edition 2005, Prentice Hall of India.
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

ME253U - MATERIAL SCIENCE AND ENGINEERING METALLURGY

Teaching Scheme: 03L **Credit: 03**

Evaluation Scheme: 30 ESE+10 ISA+ 60ESE **Total marks: 100**

Duration of ESE: 03 Hrs.

COURSE DESCRIPTION

This course provides the introduction of the fundamentals of material Science and metallurgy to undergraduate students. The objective of the course is to understand the basic principles of material science and metallurgy. It includes mechanical testing to determine mechanical properties. It also includes various heat treatments, introduction of furnaces and various engineering materials and their applications.

DESIRABLE AWARENESS/SKILLS:

Fundamental knowledge of Engineering Chemistry and Physics

COURSE OBJECTIVES:

The objectives of offering this course are to-

1. enhance the basic knowledge in the field of material science.
2. get exposure to recognize iron – carbon equilibrium diagram and solidification of steels.
3. understand the basic concept of time-temperature-transformation diagram and select proper heat treatment processes of steels according to requirements of properties.
4. understand the concept of DT & NDT, hardenability and various hardness test.
5. understand the concept of non ferrous alloys, bearing materials and their essential properties.

COURSE OUTCOMES:

On the successful completion of this course, student will be able to –

1. describe the crystal structure and classification of materials.
2. use different methods of determining mechanical properties and their applicability for in practical
3. classify cast irons and study their applications.
4. select suitable heat-treatment process to achieve desired properties of metals and alloys.

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

CO/PO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	3	-	-	-		-	-	-	-	-	-	-	-	-	-
CO 2	-	-	2	-	1	-	-	-	-	-	-	-	1	-	-
CO 3	1	-	2	-	1	-	-	-	-	-	1	-	-	-	-
CO 4	1	-		-	2	-	-	-	-	-	-	-	1	-	-

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

COURSE CONTENTS:

Metal and Metals Behavior

Classification of materials, properties and applications of materials, crystalline nature of materials, packing factor and coordination number, microscopic examinations of metals-specimen preparation, etching & its mechanism. spark testing of steels, flow line observation of forged parts relationship between structures-property-processing- performance. crystal defects and their effects on plastic deformation i.e. description of point, line and surface defects and slip and twinning & its mechanism, strengthening mechanisms in metals - solid solution, strengthening, strain hardening, dispersion and precipitation hardening, phase transformation

Material Characteristics and Materials Testing

Engineering and true stress-strain curves, evaluation of properties, ductility, brittleness and toughness. types of engineering stress-strain curve, compression test, hardness testings- Brinell hardness test, Poldi hardness test, Rockwell hardness test , Vickers hardness test. durometers, micro hardness. Erichson's cupping test, impact test- Charpy and Izod impact test, fatigue and creep test. spark testing. non-destructive test of metals-dye penetrant test, magnetic particle test. ultrasonic testing, radiography and eddy current testing.

Solid Solution

Alloys and solid solutions, types and their formations, Gibb's phase rule, lever rule for phase mixtures and their application in system.

Phase Diagram and Steels

Steels: Iron, allotropy, cooling curves and volume changes of iron. Iron-Iron carbide equilibrium diagram, critical temperatures, various phase, reactions, solubility of carbon in iron, microstructure of slowly cooled steels, Non - equilibrium of cooling of steels.

Cast Iron (C.I.): its classification (all in detail), Effects of various parameters on structure and properties of C.I. like carbon equivalent, cooling rate during eutectic reaction and alloying additions, properties, compositions, applications and specifications of cast iron.

Heat Treatment on Steels

Principle of heat treatment of steel, transformation, products of austenite, isothermal transformation diagram, procedure of plotting it diagram, continuous cooling transformations heat treatment for steels such as core heat treatment – annealing and its types, normalizing, hardening, tempering of martensite, jominy test for hardenability and its considerations. quench media, austempering and martempering, surface heat treatment of steels- flame hardening, induction hardening, laser and electron hardening, case hardening, cyaniding, nitriding , sursulf, tufftride

Engineering Steels and Non-ferrous Materials

Classification and application of steels, effect of alloying elements, specification of some commonly used steels for engineering applications, classification of alloying elements, examples of alloy steels – limitation of plain carbon steels, stainless steels-classification, heat treatment of stainless steels, tool steels-classification, cold work and hot work tool steels, high speed tool steels , heat treatment of high speed tool steel, special purpose tool steels,

Introduction to Non-ferrous Materials likes brass, bronze etc, introduction of advanced materials- types and properties of composite materials, high temperature materials, engineering ceramics.

Text Book:

1. Material Science and Metallurgy for Engineers, by V.D.Kodgire, 37th edition,Everest Publishing House. Pune,2015.
2. Material Science and Metallurgy, by U. C. Jindal, 1st edition, Pearson Publication, 2012.

Reference Books:

1. Materials and processes in manufacturing, Degarmo's, by J.T. Black, Ronald A Kosher, 10th edition, Willey student edition,2010.
2. Introduction to Engineering Materials, by B. K. Agrawal, Tata McGraw Hill, New Delhi, 1989.
3. An Introduction to Physical Metallurgy, by S.H. Avner, 2nd edition,Tata McGraw Hill, New Delhi,1997.
4. Fundamentals of modern manufacturing materials, processes and systems, by Mikell P. Groover, 4th edition,Wiley student edition, New Delh.2010.

ME254U - MACHINE DRAWING AND COMPUTER GRAPHICS

Teaching Scheme: 03L **Credit: 03**

Evaluation Scheme: 30ESE+10 ISA+ 60ESE **Total marks: 100**

Duration of ESE: 04 Hrs.

COURSE DESCRIPTION:

This course provides the elementary level knowledge of Machine Drawing and computer CAD software. 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.

DESIRABLE AWARENESS/SKILLS:

Fundamental knowledge of Engineering Graphics.

COURSE OBJECTIVES:

The objectives of offering this course are to-

1. understand the intersection curves for joining the surfaces
2. apply fundamental tolerances appropriately for various Mechanical Engg. applications.
3. know various types of standard parts with its specifications and their practical application
4. use effectively for generating the part with allied requirement by using 3D softwares.
5. use commands for assembling all parts appropriately.
6. plotting individual component and assembly in drafting mode and printing.

COURSE OUTCOMES:

On the successful completion of this course, student will be able to –

1. define the intersection curves in sheet metal work.
2. take decision about suitable relevance standard parts to be use in application.
3. draft and assigning basic tolerances and GDT on individual component.
4. imagine, recognise the function and draft the assembly and details of mechanical applications.
5. aware various kind of commands of 3D software for convert 2D sketch to 3D model for individual parts as well as assembly along with other relevant allied features in mechanical applications.

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

CO/PO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	2	3	1			-	-	-	-	-	-	-	-	1	-
CO 2	1	1				-	-	-	-	-	-	-	-	1	-
CO 3	1		2	1		-	-	-	-	-	1	-	-	1	-
CO 4			2	2	3	-	-	-	-	-	-	-	-	1	-
	1			2									-	-	-

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

COURSE CONTENT

Intersection of Surfaces

Line and curve of intersection of two solids, methods: line method, cutting-plane method. *Cases on:-* intersection of vertical prism by another horizontal prism, cylinder, cone, intersection of vertical cylinder by another horizontal cylinder, cone, prism, intersection of vertical cone by another horizontal cone, prism, cylinder.

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:

Limit and tolerances:- conventional tolerancing, definitions, concerning tolerancing and limit system, unilateral and bi-lateral limits, symbols for tolerances (theory questions on these topics are not cover in ESE examination), terminology for dimensional tolerances, selection of tolerances, representation of dimensional tolerances on drawing, deviations and fits, IT grades, fundamental tolerances and deviation and only its basic calculation for representation on drawings (no numerical), fits:-introduction to fits and its classification, of fits and its representation, hole - base and shaft -basis system of tolerance, grades of holes and relevant appropriate manufacturing processes geometric dimensioning tolerances: introduction, types, Geometric dimensioning and tolerance (GD&T) forms and position, rules for indicating tolerances, symbols of geometrical tolerance, nomenclature used in GDT, standards followed in industry (standard and prevalent representation of various forms, position and profiles) rules, typical values obtained from various manufacturing processes. (Exercises shall be based on represent symbolically dimensioning tolerance and geometrical dimensioning tolerance on various mechanical components. (No any analytical and theoretical part will be covered in questions of ESE of above).

Representation of Standard Components

Screw fasteners:-about thread, forms of threads, hands of thread, fine and coarse thread nomenclature all types screw, nut, washer & bolts, conventional representation of Nut, bolt and washer assembly, locking devices, Rivets and riveted joints, various types of keys, different kinds of couplings with empherical relation for purpose of drawing, shaft bearings:- Journal, solid, bush, pedestal and angular bearings ; thrust bearing:- pivot, foot step bearings, various types of pulleys, all types of gears and symbolic presentation(no any question shall be covered on tooth profile to be draw), locking arrangements, welding symbols. Pipe joints: - Expansion joints, stuffing box and glands, piping layouts, conventional Representation of pipe fittings, valves, joints, etc.

(Dimension parameters shall be considered as per empherical calculation. This is require and the initial part of the drawing the sketch of bolt, rivet joint, keys and couplings only and shall be answerable in brief in ESE exam without theory).

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

Reading and imagination of individual parts, understand the importance, recognisation(function) and its orientation, relation in sub- assembly and assembly. Preparation of part list and sequencing. Preparing bill of materials, assembling from given details of parts and detailing component from given assembly. Making

Assembling and details of following *:-*

1.Engine parts: stuffing box, cross head, connecting rod end, crank, eccentrics;2. *machine tool parts & accessories:* single tool post, square tool post, clapper block, shaper tool head, lathe tail stock, 4. *jigs and fixtures*: 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.

Introduction to 3D CAD Software/Package (CAD –parametric type)

Introduction to CAD software, Advantages of CAD packages, applications of CAD, the theory of CAD software ,Use of various commands for drawing, part modeling, assembling, drafting, transferring model files for analysis and produces in any kind of analytical solution and manufacturing programing software respectively, printing/plotting the drawings (except the basic essential concepts of CAD, most of the teaching part of same shall be conduct concurrently in the laboratory practical hours with practice of different exercises).

Note: (The CAD based questions shall be excluded from theory ESE, it will be included only in lab ICA ME257U).

Text Books:

1. Machine drawing, N. D. Bhatt, 38th edition, 2003 Charotar Publisher,
2. Machine Drawing, N. Sidheshwar, Shastry, Kannaiah, 4th edition, Tata Mc Graw Hill, 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, Revised Edition, S. Chand Publication, 2011
4. Machine Drawing, R.K.Dhawan, 4th edition, S. Chand& Co., 2006, Delhi.
5. Machine drawing – P.S Gill, 7th edition, S. K. Kataria publication, New Delhi, 2012 onwards.

ME255U-THEORY OF MACHINE-I LAB

Teaching Scheme: 02P **Credits: 01**

Evaluation Scheme: 25 ICA + 25 ESE **Total Marks: 50**

COURSE OBJECTIVES:

The objectives of offering this course are to-

1. validate the Grublers criterion, identify class of a mechanism.
2. analyze velocity and acceleration of each link of a mechanism
3. find the principal dimension of a mechanism depending on its application
4. identify the power transmission drives depending on its application
5. validate superposition and principle of virtual work for static force analysis

COURSE OUTCOMES:

On the successful completion of this course, student will be able to –

1. explain mobility, inversion, class-I and class-II mechanism.
2. perform the kinematic analysis of a mechanism.
3. apply various tools for the synthesis of a mechanism.
4. apply various tools for the static force analysis of a mechanism.

RELEVANCE OF COS AND POS AND STRENGTH OF CO-RELATION

CO/PO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	2	2	1	1	1	-	-	-	-	-	-	2	-	-	1
CO 2	2	2	1	1	1	1	-	-	-	-	-	2	-	-	1
CO 3	2	2	1	1	1	-	-	-	-	-	-	2	1	-	2
CO 4	2	2	1	1	1	-	-	-	-	-	-	2	1	-	1

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

COURSE CONTENT

Minimum eight experiments and two assignments shall be performed to cover entire curriculum of course ME251U. The list given below is just a guideline.

List is Experiments:

1. Demonstration of kinematic inversion of four bar mechanism, single-slider crank mechanism and double slider –crank mechanism.
2. Two problems on kinematic analysis using graphical methods.
3. Two problems on kinematic synthesis using graphical methods/analytical approach.
4. To determine mass moment of inertia of compound pendulum.
5. To determine mass moment of Inertia by Bifilar/ Trifillar suspension method.
6. Two problems on static force analysis of a mechanism.
7. Demonstration of various parts of single plate & multiple plates clutches.
8. Study of belts & pulleys.

Guidelines for ICA

Internal Continuous Assessment shall support for regular performance of practical and it's 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 approved internal continuous assessment format.

Guidelines for ESE

Oral will be based on content of syllabus and practical.

ME256U-MATERIAL SCIENCE AND ENGINEERING METALLURGY LAB

Teaching Scheme: 02P **Credit: 01**

Evaluation Scheme: 25 ICA+25 ESE **Total marks: 50**

COURSE DESCRIPTION

This course provides the introduction of the fundamentals of material science and metallurgy to undergraduate students. The objective of the course is to understand the basic principles of material science and metallurgy. It includes mechanical testing to determine mechanical properties. It also includes various heat treatments, introduction of furnaces and various engineering materials and their applications.

DESIRABLE AWARENESS/SKILLS:

Fundamental knowledge of engineering chemistry and physics

COURSE OBJECTIVES:

The objectives of offering this course are to-

1. enhance the basic knowledge in the field of material science.
2. get exposure to recognize iron – carbon equilibrium diagram and solidification of steels.
3. understand the basic concept of time-temperature-transformation diagram and select proper heat treatment processes of steels according to requirements of properties.
4. understand the concept of DT & NDT, hardenability and various hardness test.
5. understand the concept of non ferrous alloys, bearing materials and their essential properties.

COURSE OUTCOMES:

On successful completion of this course student shall be able to:-

1. describe the crystal structure and classification of materials.
2. identify methods of determining mechanical properties and their applicability for in practical.
3. classify cast irons and study their applications.
4. select suitable heat-treatment process to achieve desired properties of metals and alloys.

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

CO/PO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	3	-	-	-	-	-	-	-	-	-	1	-	-	-	-
CO 2	-	-	2	-	1	-	-	-	-	-	-	-	1	-	-
CO 3	1	-	2	-	1	-	-	-	-	-	-	-	-	-	-
CO 4	1	-	-	-	2	-	-	-	-	-	-	-	1	-	-

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

COURSE CONTENT:

Minimum eight experiments and two assignments shall be performed to cover entire curriculum of course ME253U. The list given below is just a guideline.

List of Experiments – (Any Ten shall be performed from following).

1. Detection of defect by Non-destructive tests such as dye penetrant test, magnetic particle testing, ultrasonic testing, eddy current test.(any two)
2. Destructive test malleability of sheets by Erichsen cupping test.
3. Determine hardness value of mild steel by using Poldi hardness test and its load dependant penetration variation.
4. Micro specimen preparation and use of metallurgical microscope.
5. Observing, study and drawing the microstructure of mild steel, medium carbon, eutectoid steel, hypereutectoid steel.
6. Observing, study and drawing microstructure of annealing, normalizing and hardening of medium carbon steel specimens.
7. Study and drawing microstructure of white, malleable, gray and spheriodal cast iron and any one non-ferrous metals.
8. Spark testing of steels, flow line observation of forged parts.
9. Study the Iron carbon diagram and its reactions.
10. Study the TTT diagrams and its austenitic products
11. Study the nonferrous material compositions, properties and applications.
12. Study of any one hardness test.

Guidelines 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).**

Guidelines for ESE:

Oral will be based on content of syllabus and practical.

ME257U MACHINE DRAWING AND COMPUTER GRAPHICS LAB

Teaching Scheme: 04PR **Credit : 02**

Evaluation Scheme: 25 ICA+25 ESE **Total marks : 50**

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 or any other 2 d to 3 d cad software. Students will learn about of these CAD packages and also learn how they are useful for them to develop visualization skills

DESIRABLE AWARENESS/SKILLS:

Fundamental knowledge of Engineering Graphics.

COURSE OBJECTIVES:

The objectives of offering this course are to-

1. understand the intersection curves for joining the surfaces.
2. apply fundamental tolerances appropriately for various mechanical engg. applications.
3. know various types of standard parts with its specifications and their practical application.
4. use effectively for generating the part with allied requirement by using 3D softwares.
5. use commands for assembling all parts appropriately.
6. plotting individual component and assembly in drafting mode and printing.

COURSE OUTCOMES:

On the successful completion of this course, student will be able to –

1. define the intersection curves in sheet metal work.
2. take decision about suitable relevance standard parts to be use in application.
3. draft and assigning basic tolerances and GDandT on individual component.
4. imagine, recognize the function and draft the assembly and details of mechanical applications.
5. use effectively various kind of commands of 3D software for convert 2D sketch to 3D model for individual parts as well as assembly along with other relevant allied features in mechanical application.

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

CO/PO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	2	3	1	-	-	-	-	-	-	-	-	-	-	2	-
CO 2	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO 3	1	-	2	2	-	-	-	-	-	-	-	-	-	2	-
CO 4	-	-	3	2	3	-	-	-	-	-	-	-	-	2	-
CO 5	1	-	-	3	-	-	-	-	-	-	-	-	-	2	-

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

COURSE CONTENT:

Internal continuous assessment (ICA) shall be on performances of sheets drawn and based on syllabus of course ME254U.

All ***ten*** sheets are mandatory. Each sheet shall be based and drawn as per below;

Group A :-

Draw the following sheets given in Group-A shall be hand sketched and drawn over the full imperial size of drawing sheets

(All following sheets are mandatory).

1. A drawing sheet on Intersection of Surfaces.
2. A drawing sheet on introduction of machine drawing and limit fits & tolerances conventional representation & symbol .
3. A drawing sheet on symbol and conventional Presentation of standard components,
4. A drawing sheet on details of any one of machine component's assembly.
   Note: - This sheet consist of bill of material, Boolean, tolerance chart, Miscellaneous Symbols as per requirements.
5. A drawing sheet on Assembly of any one of details component of Mechanical system.
   Note: - This sheet consist of all limit, fits, tolerances and GD & T with Machining Symbols, Boolean & bill of materials.

Group B :-

Plot and print the following sheets given in Group-B by using CAD software on A3- or A-4 size paper. Draw any five sheets among following. *Choose suitable 3D modeling CAD software.*

1. Any one part of machine shall be create in part modelling mode and plotted on A- 3 or A-4 sheet by using various commands of chosen 3D cad software.
2. Draw the three views of earlier modelled parts in part mode by draft mode and plot it on A- 3 or A-4 sheet by using various commands of 3D cad software.
3. Create and showing the threads, tolerances on various machine parts, bolts and insides of holes (any 03 component shall be created in prescribed above manner in part mode and drafted as per the principle of orthographic projection by using draft mode) and plot it on A- 3 or A-4 sheet by using various commands of 3D cad software.
4. Create any one kind of coupling in assembly mode and plot it on A- 3 or A-4 sheet by using various commands of 3D cad software.
5. Generate the details drawing of any one given assembly of mechanical system and plot it on A- 3 or A-4 sheet by using various commands of 3D cad software.
6. Generate the Assembly drawing of any one given details of mechanical system and plot it on A- 3 or A-4 sheet by using various commands of 3D cad software.

Guidelines for ICA:

Internal Continuous Assessment should support for regular performance of practical/sheets and its regular assessment with proper understanding principles of practical/ sheets completed.

Guidelines for ESE:

Oral will be base on the content of theory syllabus and practices / sheets / assignments

ESE oral Examination:

Note:- *ESE Oral examination shall be conducted to check the knowledge of theoretical as well as practical parts covered under ME254U and ME255U*

Text books:

1. A text book of Engineering Graphics with an Introduction to Computer Aided Drafting (Vol. I) by Phakatkar. H. G , 1st edition, Nirali Prakashan, Pune 1997.
2. A text book of Machine Drawing and Computer Graphics by Farazdak Haideri, Nirali Prakashan, Pune, 1998.
3. A text book of Engineering Graphics using AutoCAD by T Jeyapoovan, 3rd edition, Vikas Publication House Pvt. Ltd, Noida 2008.
4. A text book of Engineering Drawing and Graphics + AutoCAD by K. Venugopal, 4th edition, New Age International publishers, New Delhi 2005.

Reference Books:

1. N. D. Bhatt and V.M. Panchal, Machine Drawing, 5th edition, Charoter Publications,2005.
2. Mastering CAD/CAM by Zeid Ibrahim, Special Indian edition, Tata McGraw Hill New Delhi 2007.
3. Machine Drawing, R.K.Dhawan, 4th edition, S. Chand& Co. Delhi, 2006.
4. Machine drawing – P.S Gill, 7th edition, S. K. Kataria publication, New Delhi, 2012.

ME258U - WORKSHOP PRACTICE-IV

Teaching Scheme: 02P **Credit:01**

Evaluation Scheme: 50 ICA **Total Marks: 50**

COURSE OBJECTIVES:

The prime objective of offering this course is to familiarize with:-

1. milling machine, lathe, Shaper, drilling and grinding machines.
2. tool geometry of single point cutting tools, twist drill and plain Milling cutter.
3. elements of CNC Lathe and Milling machine.
4. nonconventional machining processes.

COURSE OUTCOMES:

On successful completion of this course student shall be able to:-

1. describe the Milling, lathe, Shaper, drilling and grinding machines for various mechanical engineering applications.
2. explain metal removing for particular application.
3. select CNC machine for particular application.
4. use non-conventional machining processes for particular application.

RELEVANCE OF COS AND POS AND STRENGTH OF CO-RELATION

CO/PO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	1		-	2	-	-	-	-	-	-	1	-	1	-	1
CO 2		1	1	-	1	-	-	-	-	-	-	-	-	-	-
CO 3	1	1	2	-	1	-	-	-	-	-	-	-	-	2	-
CO 4		1	-	-	-	-	-	-	-	-	-	-	1	-	1

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

COURSE CONTENT:-

Internal continuous assessment consist of performance of following practical's,

1. Machine Shop: Study and demonstration of different operations to be carried on the milling machine, lathe, Shaper, drilling and 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 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.

Guidelines 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.

Textbooks:

1. Manufacturing Engineering, M.S.Mahajan, 2nd edition 2008, Dhanpat Rai and sons, Delhi.
2. Metrology and Quality Control, M.S.Mahajan, 4th edition 2008, Dhanpat Rai and sons, Delhi.

Reference Books:

1. Element of Workshop Technology, Hajara,Volume I and II, Chaudhary and Bose S K, 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, 1st edition S. Chand Publications 2007.
4. Workshop Practice, H S Bawa, 1st edition, Tata McGraw Hill Publication 2004.
5. Workshop Technology, W.A.J. Chapman, ELBS Low Price Text, Edward Donald Pub. Ltd.

SH 250AU-INTRODUCTION TO THE CONSTITUTION OF INDIA

Teaching Scheme: 00L **Credit: 00**

Evaluation Scheme: 60 ESE **Total Marks: 60**

COURSE DESCRIPTION

The course provides knowledge about constitution of India, state and central policies, fundamental rights, fundamental duties, powers and functions of municipalities, panchayats and co-operative societies, electoral process and judiciary system.

DESIRABLE AWARENESS:

Basic knowledge of Indian Constitution

COURSE OBJECTIVES:

The objectives of offering this course are to-

1. provide knowledge about legal literacy, state and central policies, fundamental rights, fundamental duties, powers and functions of municipalities, panchayats and co-operative societies, electoral process.
2. enable the students to take up competitive examinations and also demonstrate the qualities of a responsible citizen.

COURSE OUTCOMES:

On the successful completion of this course, student shall be able to –

1. demonstrate the knowledge of basic information about Indian constitution.
2. identify individual role and ethical responsibility towards society.
3. apply the knowledge of human rights and its implications while behaving with other citizens.

COURSE OUTCOMES (COS) AND PROGRAM OUTCOMES (POS) MAPPING WITH STRENGTH OF CO-RELATION

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1						3	2	3	1			2	--	--	--
2						2	2	3	3			3	--	--	--
3						3	2	3	3			3	--	--	--

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

EVALUATION RUBRIC/SCHEME WITH RESPECT TO COS AND BLOOM'S TAXONOMY (BT)

Exam	CO			Total	BT Level						Total
	1	2	3		L1	L2	L3	L4	L5	L6	
MSE weightage	--	--	--	--	--	--	--	--	--	--	--
ESE weightage	40	40	20	100	15	40	40	5	--	--	100
ISA weightage Course Project	--	--	--	--	--	--	--	--	--	--	--

COURSE CONTENTS:

Introduction to the Constitution of India, The making of the constitution and salient features of the constitution., preamble to the constitution, fundamental rights and its limitations.

Directive Principles of state policy and relevance of directive principles, state policy fundamental duties, union executives – president, prime minister, parliament, supreme court.

State Executives: governor, chief minister, state legislature, high courts of state, electoral process in india, procedures for amendment in constitution

Human Rights – meaning and definitions, emergency provisions, working of national human rights commission in india, powers and functions of municipalities, panchyats and co - operative societies.

Text Books

1. Durga Das Basu: "Introduction to the Constitution of India", (Students Edn.) Prentice –Hall EEE, 19th / 20th Edn., 2001
2. Brij Kishore Sharma, "Introduction to the Constitution of India", PHI Learning Pvt. Ltd., New Delhi, 2011

Reference Books

1. M.V.Pylee, "An Introduction to Constitution of India", Vikas Publishing, 2002
2. Dr. B. R. Ambedkar, "Constitution of India", Government of India Publication
3. Latest Publications of Indian Institute of Human Rights, New Delhi