AS 301/AS 401: MATHEMATICS-III

UNIT–I:

Laplace Transform : Laplace transform, Existence theorem, Laplace transforms of derivatives and integrals, Initial and final value theorems, Unit step function, Dirac- delta function, Laplace transform of periodic function, Inverse Laplace transform, Convolution theorem, Application to solve simple linear and simultaneous differential equations.

UNIT–II:

Statistical Techniques: Moments, Moment generating functions, Skewness, Kurtosis, Curve fitting, Method of least squares, Fitting of straight lines, Polynomials, Exponential curves, Correlation, Linear, non–linear and multiple regression analysis, Binomial, Poisson and Normal distributions, Tests of significations: Chi-square test, t-test.

UNIT–III:

Numerical Techniques–I : Zeroes of transcendental and polynomial equations using Bisection method, Regula-falsi method and Newton-Raphson method, Rate of convergence of above methods. Interpolation: Finite differences, Newton's forward and backward interpolation, Lagrange's and Newton's divided difference formula for unequal intervals.

UNIT–IV:

Numerical Techniques–II: Solution of system of linear equations, Matrix Decomposition methods, Jacobi method, Gauss- Seidel method. Numerical differentiation, Numerical integration, Trapezoidal rule, Simpson's one third and three-eight rules, Solution of ordinary differential equations (first order, second order and simultaneous) by Euler's, Picard's and fourth-order Runge- Kutta methods.

UNIT–V:

Integral Transforms: Fourier integral, Complex Fourier transform, Inverse Transforms, Convolution Theorems, Fourier sine and cosine transform, Applications of Fourier transform to simple one dimensional heat transfer equations, wave equations and Laplace equations, Z-transform and its application to solve difference equations.

Test Books:
1. Peter V. O'Neil, Advance Engineering Mathematics Thomson (Cengage) Learning, 2007.
2. Jain, Iyenger & Jain, Numerical Methods for Scientific and Engineering Computation, New Age International, New Delhi.
3. JN Kapur, Mathematical Statistics, S. Chand & company Ltd.
4. BS Grewal, Higher Engineering Mathematics, Khanna Publishers.

1

Reference Books:
1. RK Jain & SRK Iyenger, Advance Engineering Mathematics, Narosa Publication House.
2. Chandrika Prasad, Advanced Mathematics for Engineers, Prasad Mudralaya, 1996.
3. S. S. Sastry, Introductory Methods of Numerical Analysis, PHI Learning Pvt. Limited, New Delhi
4. E. Balagurusamy, Numerical Methods, Tata McGraw-Hill Publishing Company Limited, New Delhi
5. T. Veerajan& T. Ramchandrandran, Theory & Problems in Numerical Methods, TMH, New Delhi.

SEMESTER-III

THERMODYNAMICS

L-T-P
3-2-0

UNIT-1	**Review of Fundamental Concepts and Definitions:** Introduction- Basic Concepts: System, ControlVolume, Surrounding, Boundaries, Universe, Types of Systems, Macroscopic and Microscopicviewpoints, Concept of Continuum, Thermodynamic Equilibrium, State, Property, Process, Exact & Inexact Differentials, Cycle Reversibility Quasi – static Process, Irreversible Process, Causes of Irreversibility Energy and its forms, Work and heat (sign convention), Gas laws, Ideal gas, Real gas, Law of corresponding states, Property of mixture of gases, electrical, magnetic,gravitational, spring and shaft work. **Zeroth law of thermodynamics:**Concept of Temperature and its' measurement, Temperature scales. **First law of thermodynamics:** First Law for Flow Processes - Derivation of general energy equation for a control volume;Steady state steady flow processes including throttling; Examples of steady flow devices;Unsteady processes; examples of steady and unsteady I law applications for system andcontrol volume. Limitations of first law of thermodynamics, PMM-I. Steady flow systems and their analysis, Steady flow energy equation, Boilers, Condensers, Turbine, Throttling process, Pumps etc
UNIT-2	**Second law of thermodynamics:** Thermal reservoirs, Energy conversion, Heat engines, Efficiency, Reversed heat engine, Heat pump, Refrigerator, Coefficient of Performance, Kelvin Planck and Clausius statement of second law of thermodynamics, Equivalence of the two statements. Reversible and irreversible processes, Carnot cycle and Carnot engine, Carnot theorem and it's corollaries, Thermodynamic Temperature Scale, PMM-II. **Entropy:** Clausius inequality, Concept of Entropy, Entropy change of pure substance in different thermodynamic processes, Tds equation, Principle of entropy increase, T-S diagram, Statement of the third law of thermodynamics.
UNIT-3	**Availability and Irreversibility:** Available and unavailable energy, Availability and Irreversibility, Second law efficiency, Helmholtz & Gibb's function. **Thermodynamic relations:** Conditions for exact differentials. Maxwell relations, Clapeyron equation, Joule-Thompson coefficient and Inversion curve. Coefficient of volume expansion, Adiabatic and Isothermal compressibility
UNIT-4	**Properties of steam and Rankine cycle:** Pure substance, Property of Pure Substance (steam), Triple point, Critical point, Saturation states, Sub-cooled liquid state, Superheated vapour state, Phase transformation process of water, Graphical representation of pressure, volume and temperature, P-T, P-V and P-h diagrams, T-S and H-S diagrams, use of property diagram, Steam-Tables &Moller chart, Dryness factor and it's measurement, processes involving steam in closed and open systems. Simple Rankine cycle. Air-water vapour mixture and Psychrometry: Psychometric terms and their definitions, Psychometric chart, Different Psychometric processes and their representation on Psychometric chart
UNIT-5	**Refrigeration Cycles:** Reversed Carnot Cycle for gas and vapour. Refrigeration capacity, unit of refrigeration.Air Refrigeration cycles; Reversed Brayton Cycle and Bell Coleman Cycle. Vapour compression refrigeration cycle; simple saturated cycle and actual vapour compression refrigeration cycle. Analysis of cycles, effect of superheating, sub-cooling and change in evaporator and condenser pressure on performance of vapour compression refrigeration cycle. Refrigerants; their classification and desirable properties. Vapour absorption refrigeration system

Books and References:
1-Basic and Applied Thermodynamics by PK Nag, MCGRAW HILL INDIA.
2-Thermodynamics for Engineers by Kroos& Potter, Cengage Learning.
3-Thermodynamics by Shavit and Gutfinger, CRC Press.
4-Thermodynamics- An Engineering Approach by Cengel, MCGRAW HILL INDIA.
5-Basic Engineering Thermodynamics, Joel, Pearson.
6-Engineering Thermodynamics by Dhar, Elsevier..

MATERIALS ENGINEERING

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UNIT-I

Crystal Structure: Unit cells, Metallic crystal structures, Ceramics. Imperfection in solids:Point, line, interfacial and volume defects; dislocation strengthening mechanisms and slipsystems, critically resolved shear stress.

Mechanical Property measurement: Tensile, compression and torsion tests; Young'smodulus, relations between true and engineering stress-strain curves, generalized Hooke'slaw, yielding and yield strength, ductility, resilience, toughness and elastic recovery;Hardness: Rockwell, Brinell and Vickers and their relation to strength.

UNIT-II

Static failure theories: Ductile and brittle failure mechanisms, Tresca, Von-mises, Maximumnormal stress, Mohr-Coulomb and Modified Mohr-Coulomb; Fracture mechanics:Introduction to Stress-intensity factor approach and Griffith criterion. Fatigue failure: Highcycle fatigue, Stress-life approach, SN curve, endurance and fatigue limits, effects of meanstress using the Modified Goodman diagram; Fracture with fatigue, Introduction to non-destructive testing (NDT).

UNIT-III

Alloys, substitutional and interstitial solid solutions- Phase diagrams: Interpretation of binaryphase diagrams and microstructure development; eutectic, peritectic, peritectoid and monotectic reactions. Iron Iron-carbide phase diagram and microstructural aspects ofledeburite, austenite, ferrite and cementite, cast iron.

UNIT-IV

Heat treatment of Steel: Annealing, tempering, normalising and spheroidising, isothermaltransformation diagrams for Fe-C alloys and microstructure development. Continuouscooling curves and interpretation of final microstructures and properties-austempering,martempering, case hardening, carburizing, nitriding, cyaniding, carbo-nitriding, flame andinduction hardening, vacuum and plasma hardening.
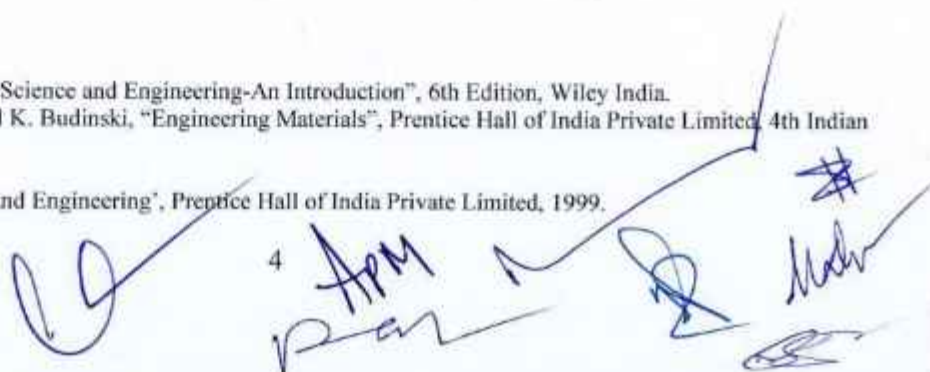
UNIT-V

Alloying of steel, properties of stainless steel and tool steels, maraging steels- cast irons;grey, white, malleable and spheroidal cast irons- copper and copper alloys; brass, bronze andcupro-nickel; Aluminium and Al-Cu – Mg alloys- Nickel based superalloys and Titaniumalloys.

Books and References:

1-W. D. Callister, 2006, "Materials Science and Engineering-An Introduction", 6th Edition, Wiley India.
2-Kenneth G. Budinski and Michael K. Budinski, "Engineering Materials", Prentice Hall of India Private Limited, 4th Indian Reprint, 2002.

3-V. Raghavan, "Material Science and Engineering", Prentice Hall of India Private Limited, 1999.

4-Mechanics of materials by James M.Gere.
5-Introduction to engineering materials by B.K. Agarwal.
6-Physical metallurgy and advanced materials by R.E. Smallman.
7-Engineering mechanics of composite materials by Isaac M. Daniel.
8-U. C. Jindal, "Engineering Materials and Metallurgy", Pearson, 2011.

MATERIAL TESTING LAB

L-T-P
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List of Experiments: (At least 8 of the following)

1. Strength test of a given mild steel specimen on UTM with full details and stress versus strain plot on the machine.
2. Other tests such as shear, bend tests on UTM.
3. Impact test on impact testing machine like Charpy, Izod or both.
4. Hardness test of given specimen using Rockwell and Vickers/Brinell testing machines.
5. Spring index test on spring testing machine.
6. Fatigue test on fatigue testing machine.
7. Creep test on creep testing machine.
8. Experiment on deflection of beam, comparison of actual measurement of deflection with dial gauge to the calculated one, and or evaluation of young's modulus of beam.
9. Torsion test of a rod using torsion testing machine.
10. Study of NDT (non-destructive testing) methods like magnetic flaw detector, ultrasonic flaw detector, eddy current testing machine, dye penetrant tests.

FLUID MECHANICS AND FLUID MACHINES

L-T-P
3-1-0

UNIT-I

Definition of fluid, Newton's law of viscosity, Units and dimensions-Properties of fluids,mass density, specific volume, specific gravity, viscosity, compressibility and surfacetension, Incompressible flow, Bernoulli's equation and its applications - Pitot tube, orifice meter, venturi meter and bend meter, notches and weirs, momentum equation and its application to pipe bends.

UNIT-II

Continuum & free molecular flows. Steady and unsteady, uniform and non-uniform, laminar and turbulent flows, rotational and irrotational flows, compressible and incompressible flows, subsonic, sonic and supersonic flows, sub-critical, critical and supercritical flows, one, two- and three-dimensional flows, streamlines, continuity equation for 3D and 1D flows, circulation, stream function and velocity potential. Buckingham's Pi theorem, important dimensionless numbers and their significance.

UNIT-III

Equation of motion for laminar flow through pipes, turbulent flow, isotropic, homogenous turbulence, scale and intensity of turbulence, measurement of turbulence, eddy viscosity, resistance to flow, minor losses, pipe in series and parallel, power transmission through a pipe, siphon, water hammer, three reservoir problems and pipe networks.

Boundary layer thickness, boundary layer over a flat plate, laminar boundary layer, application of momentum equation, turbulent boundary layer, laminar sublayer, separation and its control, Drag and lift, drag on a sphere, a two-dimensional cylinder, and an aerofoil, Magnus effect.

UNIT-IV

Introduction to hydrodynamic thrust of jet on a fixed and moving surface, Classification of turbines,

Impulse turbines, Constructional details, Velocity triangles, Power and efficiency calculations,

Governing of Pelton wheel.

Francis and Kaplan turbines, Constructional details, Velocity triangles, Power and efficiency Principles of similarity, Unit and specific speed, Performance characteristics, Selection of water turbines.

UNIT-V

Classifications of centrifugal pumps, Vector diagram, Work done by impellor, Efficiencies of centrifugal pumps, Specific speed, Cavitation & separation, Performance characteristics. Reciprocating pump theory, Slip, Indicator diagram, Effect of acceleration, air vessels, Comparison of centrifugal and reciprocating pumps, Performance characteristics.

Books and References:
1-Introduction to fluid mechanics and Fluid machines by S.K Som, Gautam Biswas, S Chakraborty.
2-Fluid mechanics and machines by R.K Bansal.
3-F. M. White, Fluid Mechanics, 6th Ed., Tata McGraw-Hill, 2008.
4-Fluid Mechanics and Its Applications byV.K.Gupta et.al.
5-Fluid Mechanics byYunusCengel.
6-Batchelor, G. K. (1999). Introduction to fluid dynamics. New Delhi, India: Cambridge University Press.
7-Acheson, D. J. (1990). Elementary fluid dynamics. New York, USA: Oxford UniversityPress.
8R.W. Fox, A.T. McDonald and P.J. Pritchard, Introduction to Fluid Mechanics, 6th Ed., John Wiley, 2004

FLUID MECHANICS LAB

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List of Experiments:(At least 8 of the following)

1. 1-To determine the coefficient of impact for vanes.
2. To determine coefficient of discharge of an orifice meter.
3. To determine the coefficient of discharge of Notch (V and Rectangular types).
4. To determine the friction factor for the pipes.
5. To determine the coefficient of discharge of venturi meter.
6. To determine the coefficient of discharge, contraction & velocity of an orifice.
7. To verify the Bernoulli's Theorem.
8. To find critical Reynolds number for a pipe flow.
9. To determine the meta-centric height of a floating body.
10. To determine the minor losses due to sudden enlargement, sudden contraction and bends.
11. To show the velocity and pressure variation with radius in a forced vertex flow.

STRENGTH OF MATERIALS

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UNIT I STRESS, STRAIN AND DEFORMATION OF SOLIDS

Rigid bodies and deformable solids – Tension, Compression and Shear Stresses – Deformation of simple and compound bars – Thermal stresses – Elastic constants – Volumetric strains –Stresses on inclined planes – principal stresses and principal planes – Mohr's circle of stress.

UNIT II TRANSVERSE LOADING ON BEAMS AND STRESSES IN BEAM

Beams – types transverse loading on beams – Shear force and bending moment in beams – Cantilevers – Simply supported beams and over – hanging beams. Theory of simple bending– bending stress distribution – Load carrying capacity – Proportioning of sections – Flitched beams – Shear stress distribution.

UNIT III TORSION

Torsion formulation stresses and deformation in circular and hollows shafts – Stepped shafts– Deflection in shafts fixed at the both ends – Stresses in helical springs – Deflection of helical springs, carriage springs.

UNIT IV DEFLECTION OF BEAMS

Double Integration method – Macaulay's method – Area moment method for computation of slopes and deflections in beams – Conjugate beam and strain energy – Maxwell's reciprocal theorems.

UNIT V THIN CYLINDERS, SPHERES AND THICK CYLINDERS

Stresses in thin cylindrical shell due to internal pressure circumferential and longitudinal stresses and deformation in thin and thick cylinders – spherical shells subjected to internal pressure –Deformation in spherical shells – Lame's theorem.

8

ADVANCED WELDING TECHNOLOGY

L-T-P
2-0-0

Unit-I

Introduction : Importance and application of welding, classification of welding process. Selection of welding process. 2 Brief review of conventional welding process : Gas welding, Arc welding, MIG, TIG welding. Resistance welding. Electroslag welding, Friction welding etc. Welding of MS.CI, Al, Stainless steel & Maurer/Schaefflar Diagram. Soldering & Brazing.

Unit-II

Advanced welding Techniques- Principle and working and application of advanced welding techniques such as Plasma Arc welding, Laser beam welding. Electron beam welding, Ultrasonic welding etc.

Unit-III

Advanced welding Techniques (continued) : Principle and working and application of advanced welding techniques such as explosive welding/ cladding, Underwater welding, Spray-welding / Metallising. Hard facing.

Unit-IV

Weld Design : Welding machines/equipments and its characteristics and arc-stability, Weld defects and distortion and its remedies, Inspection/testing of welds, Weld Design, Welding of pipe-lines and pressure vessels. Life predication. Thermal and Metallurgical consideration.: Thermal considerations for welding, temperature distribution, Analytical/Empirical analysis/formulae, heating & cooling curves.
Metallurgical consideration of weld, HAZ and Parent metal, micro & macro structure. Solidification of

weld and properties.

Books
1. Welding Hand Book
2. Metal Casting and Joining – John.K.C- PHI Publications
3. Welding & Welding Technology- Richard L Little. Mc Graw Hill
4. Welding Principles and Practices – EdwardR. Bohnart , Mc Graw Hill, 4th Edition

SEMESTER-4TH

L-T-P
3-2-0

AS 401	INDUSTRIAL SOCIOLOGY
Unit	Topic
I	Industrial Sociology: Nature, Scope and Importance of Industrial Sociology. Social Relations in Industry, Social Organisation in Industry- Bureaucracy, Scientific Management and Human Relations.
II	Rise and Development of Industry: Early Industrialism – Types of Productive Systems – The Manorial or Feudal system. The Guild system, The domestic or putting-out system, and the Factory system. Characteristics of the factory system. Causes and Consequences of industrialization. Obstacles to and Limitations of Industrialization.
III	Industrialization in India. Industrial Policy Resolutions - 1956.Science. Technology and Innovation Policy of India 2013.
	Contemporary Issues: Grievances and Grievance handling Procedure. Industrial Disputes: causes, Strikes and Lockouts. Preventive Machinery of Industrial

IV	Disputes: Schemes of Workers Participation in Management- Works Committee, Collective Bargaining, Bi-partite & Tri-partite Agreement, Code of Discipline, Standing Orders. Labour courts & Industrial Tribunals.
V	Visualizing the future: Models of industrialization- Collectivist, anarchist, free market, environmentalist, etc. Cultural issues, consumer society and sociological concerns.

References:

1. PREMVIR KAPOOOR, Sociology & Economics for Engineers, Khanna Publishing House (Edition 2018).

2. GISBERT PASCAL, Fundamentals of Industrial sociology, Tata McGraw Hill, New Delhi, 1972.

2. SCHNEIDER ENGNO V., Industrial Sociology 2nd Ed., McGraw Hill Publishing Co., New Delhi, 1979.

3. MAMORIA C.B. And MAMORIA S., Dynamics of Industrial Relations in India.

4. SINHA G.P. and P.R.N. SINHA, Industrial Relations and Labour Legislations, New Delhi, Oxford and IBH Publishing Co., 1977.

5. S.C. SHARMA, Industrial Safety and Health Management, Khanna Book Publishing Co. (P) Ltd., Delhi (ISBN: 978-93-86173-188)

5. NADKARNI, LAKSHMI, Sociology of Industrial Worker, Rawat, Jaipur,1998.

6. BHOWMICK SHARIT, Industry, Labour and Society,Orient, 2012.

RICHARD BROWN, JOHN CHILD, AND S R PARKER. The Sociology of Industry 1st Edition, Routledge, 2015.

APPLIED THERMODYNAMICS

L-T-P
3-2-0

UNIT I

Introduction to solid, liquid and gaseous fuels– Stoichiometry, exhaust gas analysis- First lawanalysis of combustion reactions- Heat calculations using enthalpy tables- Adiabatic flametemperature-Chemical equilibrium and equilibrium composition calculations using freeenergy.Introduction and Otto, Diesel and Dual cycles.

UNIT II

Vapour Power cycles:
Vapor power cycles Rankine cycle with superheat, reheat and regeneration, exergy analysis. Rankine cycle, effect of pressure and temperature on Rankine cycle, Reheat cycle, Regenerative cycle, Feed water heaters, Binary vapour cycle, Combined cycles, Cogeneration.

Fuels and Combustion: Combustion analysis, heating values, air requirement, Air/Fuel ratio, standard heat of reaction and effect of temperature on standard heat of reaction, heat of formation, Adiabatic flame temperature.

UNIT III

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Boilers: Classifications and working of boilers, boiler mountings and accessories, Draught and its calculations, air pre-heater, feed water heater, super heater. Boiler efficiency, Equivalent evaporation. Boiler trial and heat balance.

Condenser: Classification of condenser, air leakage, condenser performance parameters.

UNIT IV

Steam and Gas Nozzles: Flow through Convergent and convergent-divergent nozzles, variation of velocity, area and specific volume, choked flow, throat area, Nozzle efficiency, Off design operation of nozzle, Shock waves stationary normal shock waves, Effect of friction on nozzle, Super saturated flow.

Steam Turbines: Classification of steam turbine, Impulse and Reaction turbines, Staging, Stage and Overall efficiency, reheat factor, Bleeding, Velocity diagram of simple and compound multistage impulse and reaction turbines and related calculations, work done, efficiencies of reaction, Impulse reaction turbines, state point locus, Losses in steam turbines, Governing of turbines, Comparison with steam engine.

UNIT V

Gas Turbine: Gas turbine classification, Brayton cycle, Principles of gas turbine, Gas turbine cycles with intercooling, reheat and regeneration and their combinations, Stage efficiency, Polytropic efficiency. Deviation of actual cycles from ideal cycles
Jet Propulsion: Introduction to the principles of jet propulsion, Turbojet and turboprop engines andtheir processes, Principle of rocket propulsion, Introduction to Rocket Engine.

Reciprocating compressors, staging of reciprocating compressors, optimal stage pressureratio, effect of intercooling, minimum work for multistage reciprocating compressors.

Books and References:
1. Basic and Applied Thermodynamics by P.K. Nag, mcgraw hill india.
2. Applied thermodynamics by Onkar Singh, New Age International.
3. Applied Thermodynamics for Engineering Technologists by Eastop, Pearson Education.
4. Applied Thermodynamics by Venkanna And Swati, PHI.

APPLIED THERMODYNAMICS LAB

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List of Experiments: (At least 8 of the following)

1. Study of Fire Tube boiler.
2. Study of Water Tube boiler.
3. Study and working of Two stroke petrol Engine.
4. Study and working of Four stroke petrol Engine.
5. Determination of Indicated H.P. of I.C. Engine by Morse Test.
6. Prepare the heat balance sheet for Diesel Engine test rig.
7. Prepare the heat balance sheet for Petrol Engine test rig.
8. Study and working of two stroke Diesel Engine.
9. Study and working of four stroke Diesel Engine.
10. Study of Velocity compounded steam turbine.
11. Study of Pressure compounded steam turbine.
12. Study of Impulse & Reaction turbine.
13. Study of steam Engine model.

14. Study of Gas Turbine Model.

MANUFACTURING PROCESSES

L.-T-P
3-2-0

UNIT-I
Conventional Manufacturing processes:
Casting and moulding: Metal casting processes and equipment, Heat transfer andsolidification, shrinkage, riser design, casting defects and residual stresses.Introduction to bulk and sheet metal forming, plastic deformation and yield criteria;fundamentals of hot and cold working processes; load estimation for bulk forming (forging,rolling, extrusion, drawing) and sheet forming (shearing, deep drawing, bending) principlesof powder metallurgy.

UNIT-II
Metal cutting: Single and multi-point cutting; Orthogonal cutting, various force components:Chip formation, Tool wear and tool life, Surface finish and integrity,Machinability, cutting tool materials,

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cutting fluids, Coating; Turning, Drilling, Milling and finishing processes,Introduction to CNC machining.Additive manufacturing: Rapid prototyping and rapid toolingJoining/fastening processes: Physics of welding, brazing and soldering;design considerationsin welding,Solid and liquid state joining processes;Adhesive bonding.

UNIT-III
Grinding & Super finishing:
Grinding: Grinding wheels, abrasive & bonds, cutting action. Grinding wheel specification. Grinding wheel wear - attritions wear, fracture wear. Dressing and Truing. Max chip thickness and Guest criteria. Surface and cylindrical grinding. Centreless grinding. Super finishing: Honing, lapping and polishing.

UNIT-IV
Metal Joining (Welding):
Survey of welding and allied processes. Gas welding and cutting, process and equipment. Arc welding: Power sources and consumables. TIG & MIG processes and their parameters. Resistance welding - spot, seam projection etc. Other welding processes such as atomic hydrogen, submerged arc, electroslag, friction welding. Soldering & Brazing. Adhesive bonding. Weld decay in HAZ.

UNIT-V
Unconventional Machining Processes:
Abrasive Jet Machining, Water Jet Machining, Abrasive Water Jet Machining, UltrasonicMachining, principles and process parameters. Electrical Discharge Machining, principle and processes parameters, MRR, surface finish,tool wear, dielectric, power and control circuits, wire EDM; Electro-chemical machining(ECM), etchant &maskant, process parameters, MRR and surface finish.Laser Beam Machining (LBM), Plasma Arc Machining (PAM) and Electron BeamMachining.

Books and References:
1. Kalpakjian and Schmid, Manufacturing processes for engineering materials (5th Edition)- Pearson India, 2014.
2. Mikell P. Groover, Fundamentals of Modern Manufacturing: Materials, Processes, and Systems.
3. Manufacturing Technology by P.N. Rao., MCGRAW HILL INDIA.
4. Materials and Manufacturing by Paul Degarmo
5. Manufacturing Processes by Kaushish, PHI.
6. Principles of Foundry Technology, Jain, MCGRAW HILL INDIA
7. Production Technology by RK Jain.

MEASUREMENT & METROLOGY

Unit-1: Mechanical Measurement

Need of mechanical measurement, Basic definitions: Hysteresis, Linearity, Resolution of measuring instruments, Threshold, Drift, Zero stability, loading effect and system response. Measurement methods, Generalized Measurement system, Static performance characteristics, Errors and their classification.

Unit-2: Linear and angular measurements

Linear Measurement Instruments, Vernier calliper, Micrometer, Interval measurements: Slip gauges, Checking of slip gauges for surface quality, Optical flat, Limit gauges, Problems on measurements with gauge.

Unit-3: Measurement of Force, Torque and Strain

Force measurement: load cells, cantilever beams, proving rings, differential transformers. Measurement of torque: Torsion bar dynamometer, servo controlled dynamometer, absorption dynamometers. Power Measurements. Measurement of strain: Mechanical strain gauges, electrical strain gauges, strain gauge: materials, gauge factors, theory of strain gauges and method of measurement, bridge arrangement, temperature compensation.

Unit-4: Displacement, Velocity/Speed, and Acceleration, Measurement

Working principal of Resistive Potentiometer, Linear variable differential transducers, Electro Magnetic Transducers, Mechanical, Electrical and Photoelectric Tachometers, Piezoelectric Accelerometer, Seismic Accelerometer

Unit-5: Temperature measurement

Temperature Measuring Devices: Thermocouples, Resistance Temperature Detectors, Thermistor, Liquid in glass Thermometers, Pressure Thermometers, Pyrometer, Bimetallic strip. Calibration of temperature measuring devices, Numerical Examples on Flow Measurement.
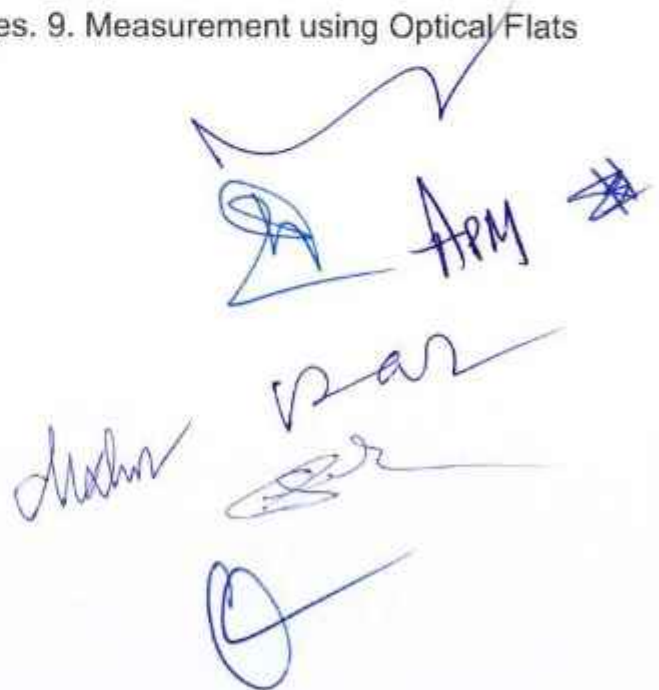
Measurement & metrology lab

1. Measurement using Optical Projector / Toolmaker Microscope.

2. Measurement of angle using Sine Center / Sine bar / bevel protractor

3. Measurement of alignment using Autocollimator / Roller set

4. Measurement of cutting tool forces using a) Lathe tool Dynamometer OR b) Drill tool Dynamometer.

5. Measurement of Screw threads Parameters using two wire or Three-wire methods.

6. Measurement of Surface roughness, using Tally Surf/Mechanical Comparator.

7. Measurement of gear tooth profile using gear tooth Vernier /Gear tooth micrometer.

8. Calibration of Micrometer using slip gauges. 9. Measurement using Optical Flats

ELECTRICAL MACHINE & AUTOMATIC CONTROL

UNIT I

Single phase Transformer: Efficiency Voltage regulation, O.C.& S.C. Tests.

Three Phase Transformer: Three phase transformer connections, Auto Transformer: Volt-Amp relations,

Efficiency, Advantages & Disadvantages, Applications.

D.C. Motors: Concept of starting, Speed control, Losses and Efficiency (simple numericals only)

UNIT II

Three phase Induction Motor: Construction, Equivalent circuit, Torque equation and torque-slip

characteristics, Speed control (simple numericals only).

Alternator: Construction, e.m.f. equation, Voltage regulation and its determination by synchronous

impedance method. (simple numericals only)

Synchronous Motor (conceptual treatment only): Starting. Effect of excitation on line current (V-curves),

Synchronous condenser.

Servo Motor: Two phase AC and DC servo motors & their applications.

UNIT III

Modeling of Mechanical System: Linear mechanical elements, Force-voltage and force-current analogy,

Electrical analog of simple mechanical systems; Concept of transfer function & its determination for

simple systems.

Control System: Open loop & closed loop controls systems; advantages and disadvantages.

Signals: Unit step, Unit ramp, Unit impulse and Periodic signals with their mathematical representation

and characteristics.

UNIT IV

Time Response Analysis: Time response of a standard second order system and response specifications.

Stability: Concept and types of stability, Routh Hurwitz Criterion and its application for determination of

stability, Limitations (simple numerical only); Only conceptual treatment of Polar plot, Nyquist stability

criterion and assessment of stability.

UNIT V

Root Locus Techniques: Concept of root locus, construction of root loci. Bode plot, Gain margin and

Phase margin and their determination.

Process control: Introduction to P, PI and PID controllers their characteristics, representation and applications.

Books and References:

1. I. J. Nagrath & D. P. Kothari, "Electrical machines", Tata McGraw Hill.
2. P.S.Bimbhra, "Electrical Machinery", Khanna Publishers
3. K. Ogata, "Modern Control Engineering", Prentice Hall of India.
4. Ghosh, "Control Systems: Theory and Applications", Pearson
5. B.C. Kuo, "Automatic Control systems", Wiley India Ltd.
6. D. Roy Choudhary, "Modern Control Engineering" Prentice Hall of India.
7. M. Gopal, "Control Systems: Principles and Design" Tata McGraw Hill.

PRODUCTION PLANNING & CONTROL

L T P

3 2 0

Unit-I

Introduction:Types and characteristics of Manufacturing systems and Production systems, Objective and functions of Production, Planning & Control, organization

Preplanning:Forecasting & Market Analysis.Factory Location & Layout, Equipment policy and replacement. Preplanning production, capacity planning

Unit-II

Production Planning:Product development and design. BEP, profit volume chart, Material Resource Planning, Selection of material, methods, machines & manpower. Routing, Loading, Scheduling, Job shop scheduling, sequencing of production operation, line balancing

Unit-III

ProductionControl:Dispatching rules, dispatching of work card, move card, inspection card and reports, Control boards and charts. Expediting, progress reporting, corrective action, change in schedules.

Unit-IV

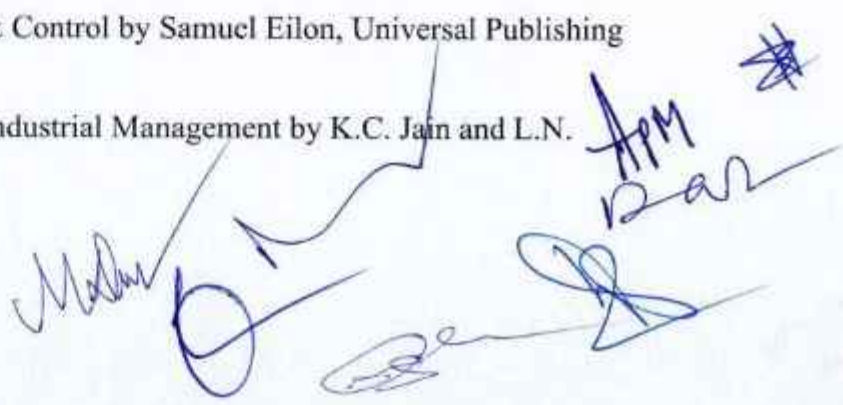Evaluation and Analysis:Elements of network and its development, Introduction to CPM and PERT techniques.

UNIT-V

Material Planning and Control:Field and scope, material planning, inventories, types and classification, ABC analysis, economic lot (batch) size, lead time and reorder point, modern trends in purchasing, store keeping, store operations, Introduction to manufacturing resource planning (MRP) and enterprise resource planning (ERP)

Books and References:

1-Elements of Production Planning & Control by Samuel Eilon, Universal Publishing Corporation.

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