SHRI GURU GOBIND SINGHJI INSTITUTE OF ENGINEERING TECHNOLOGY VISHNUPURI, NANDED – 431 606
S. Y. B. Tech. (Mechanical)
From the batch 2014-15

Sr No	Course Code	Course Name	Credits		Theory	Tutorial	Practical
			Th	Pr	(Number of Hours/Week)		
Odd Semester							
1	MA2011	Engineering Mathematics-III	4	--	3	1	--
2	ME2321	Strength of Material	3	1	3	--	2
3	ME2331	Applied Thermodynamics	3	1	3	--	2
4	ME2341	Manufacturing Processes-I	3	1	3	--	2
5	ME2351	Engineering Metallurgy	3	1	3	--	2
6	ME2361	Machine Drawing & Computer Aided Drafting	2	1	2	--	2
		Sub Total	**18**	**5**	**17**	**1**	**10**
Even Semester							
7	ME2411	Engineering Mathematics-IV	4	--	3	1	--
8	ME2421	Theory of Machines	4	1	4	--	2
9	ME2431	Mechanical Measurements and Metrology	4	1	4	--	2
10	ME2441	Fluid Mechanics	3	1	3	--	2
11	ME2451	Manufacturing Processes-II	3	1	3	--	2
12	ME2461	Cost Estimation	--	1	--	--	2
13	ME2471	Communication Skills	--	1	--	--	2
		Sub Total	**18**	**6**	**17**	**1**	**12**
		Total Credits Earned	**36 + 11 = 47**				

Note:

1. Evaluation of the theory subjects shall consist of midterm examination (30% marks) and end term examination (70% Marks) as per Academic Calendar of the Institute.
2. Evaluation of term work and practical's shall consist of weekly (continuous) evaluation (50% marks) and end term external evaluation (50% marks).
3. Continuous evaluation of the term work shall include presentation by a group / an individual on some recent / advanced topic of the concerned subject associated with a report submission.
4. ***Students directly admitted to Second Year after Diploma shall have to undergo an additional audit course on "Environmental Studies" in the fourth semester***.

MA2011 – ENGINEERING MATHEMATICS-III

(CREDITS THEORY: 04)

Course code: MA2011 **Contact Hours/Week:** Th.03, T.01

Evaluation Scheme:

Theory	Practical
Mid Term: 30 Marks	---
End Term: 70 Marks	---

Course Content:

Second Order Differential Equations: Homogenous linear differential equations for real and complex roots. Modeling: free oscillations, Euler-Cauchy equation, Existence and Uniqueness theorem (without proof) and Wronskian, non-homogenous equations, solutions by undetermined coefficients and variation of parameter methods. Modeling: forced oscillations, resonance and electrical circuits, system of differential equations.

Laplace Transform (LT): Definition, existence theorem, linearity property of LT, LT of standard functions, theorems on LT, Inverse Laplace transforms (ILT), convolution theorem, unit step function, impulse function, LT of periodic functions, applications to initial and boundary value problems.

Fourier Series: Periodic functions, Fourier theorem, Fourier series, Euler's formulas for the Fourier coefficients, convergence of Fourier series, Change of interval, even and odd functions, half range Fourier series.

Partial Differential Equations: Separation of variables, Vibrations of string, one dimensional Heat Equation.

Reference Books:

1. Advanced Engineering Mathematics, (Eighth Edition) by: Erwin Kreyszig. Pub. : John Wiley & Sons.
2. Advanced Engineering Mathematics, (Second Edition) by: R. K. Jain and S. R. K. Iyengar. Pub. : Narosa Publication House.
3. Elementary Differential Equations and Boundary Value Problem By Boycsand DiPrima, Seventh Edition. Pub. : John Wiley & Sons
4. Calculus, by Thomos and Finney, Ninth edition.

ME2321 – STRENGTH OF MATERIALS
(CREDITS THEORY: 03, PRACTICAL: 01)

Course code: ME2321 **Contact Hours/Week:** Th.03, Pr.02

Course Objective:

- To understand fundamentals of the mechanical behavior of non-rigid materials.
- To understand the ability of materials to withstand various types of loads.
- To understand the foundation for design of mechanical elements.

Evaluation Scheme:

Theory	Practical
Mid Term : 30 Marks	Continuous Evaluation : 50%
End Term : 70 Marks	Practical Examination : 50%

Course Content:

Simple Stress and Strain: Concept of stress and strain (linear, lateral, shear & volumetric), Hookes Law, Elastic constants & their relationship, Stresses of varying section in step, circular and rectangular, Temperature stresses.

Principal Stresses and Strains: Normal & shear stress on any oblique plane & concept of principal plane, principal planes by analytical methods & graphical method.

Strain Energy: Strain energy due to axial loads, impact loads.

Bending Stresses: Theory of simple bending, Concept and assumptions, Derivation of flexure formula, Bending stresses distribution diagram, Different IS steel section, Flitched beams, Design of a section.

Shear Stress in Beams: Concept and derivation of shear stress distribution formula, Shear stress distribution diagram for symmetrical and unsymmetrical section.

Combined direct and bending stresses: Introduction, stress distribution for an eccentric loaded rectangular section, the middle third rule, core or kernel section, circular solid and hollow section, structural section.

Torsion of Circular Shaft: Theory of torsion of shaft of circular cross section, Assumptions, Derivation of torsion formulae, Stress in shaft of hollow, solid, composite circular cross section subjected to twisting moments, Stresses due to combined torsion, bending and axial force on shaft, Flanged coupling.

Thin & Thick Pressure Vessels: *Thin pressure vessels*: Stress, Strain and deformation in thin walled seamless cylindrical and spherical vessels. *Thick pressure vessels*: Lame's theory, Stresses in thick cylindrical shell and compound cylinder, Initial difference of radii at the junction of compound tube, Stresses in thick spherical shell.

Deflection of Beams: Concept of deflection, Slope and deflection by double integration method (Macauley's method). Slope and deflection for simply supported, cantilever and statically determinate beam.

Axially Loaded Columns: Concept of critical load and buckling, Derivation of Euler's formula for buckling load with various end conditions, limitations of Euler's formula, Rankine buckling load, Safe load on column.

Practical Work:

List of Experiments:

The term work shall consist of following lab test on mechanical properties of material.

1. Tension test on M.S. and TOR bar (ductile and brittle material).
2. Bending test.
3. Shear test.
4. Torsion test.
5. Hardness test.
6. Impact test.

Practical Examination:

End Term Examination shall be a practical /oral examination.

Reference Books:

1. Timoshenko and Young, Strength of Material, East West Press, 2011.
2. A. Pytel and F. L. Singer, Strength of Material, 4th Edition, Harper & Row, 1987.
3. A. R. Basu, "Strength of materials", Dhanapatrai & company, New Delhi.
4. I. B. Prasad," Engineering Mechanics and Strength of Materials", Khanna Publishers, 1992.
5. S. Ramamurthum," Strength of Materials", Dhanapatrai & Publication, New Delhi

ME 2331- APPLIED THERMODYNAMICS
(CREDITS THEORY: 03, PRACTICAL: 01)

Course code: ME2331 **Contact Hours/Week:** Th: 03, Pr.02

Course Objective:

- To understand thermodynamic cycles and its applications.
- To understand steam engineering concepts.
- To understand the chemistry of combustion and analysis of combustion products.

Evaluation Scheme:

Theory	Practical
Mid Term :30 Marks	Continuous Evaluation : 50%
End Term:70 Marks	Practical Examination : 50%

Course Content:

Air Standard Cycle: Introduction, Carnot cycle, Otto cycle, Diesel cycle, Dual combustion cycle, Brayton cycle

Vapour Power Cycle: Properties of steam, Carnot cycle, Rankine cycle, Modified Rankine cycle, Regenerative cycle, Reheat cycle

Properties of steam: Introduction, Steam generation, Properties of steam, Steam property charts (steam table and Mollier chart), Measurement of dryness fraction of steam.

Steam Engineering: Introduction, Classification of boilers, study of boilers, Boiler mountings and accessories, Performance of boilers. Introduction to steam engine.

Nozzle: Types of nozzle, flow through steam nozzle, mass of steam discharged through a nozzle, condition for maximum discharge, critical pressure ratio, general relationship between area, velocity and pressure, steam injector.

Condensers: Introduction, functions, necessity, types of condensers, performance of condensers, air leakage in condensers, air pump, cooling towers.

Power Plants: Introduction to steam power plant, hydraulic power plant, nuclear power plant.

Air compressors: Application of compressed air, classification of air compressors, Terminology, single stage reciprocating air compressor, work done, effect of clearance volume, Performance multistage air compression, advantages and disadvantages, two stage air compressor with perfect intercooling, two stage air compressor with imperfect intercooling, minimum work required for a two stage compressor with perfect intercooling, ratio of cylinder diameters, heat rejected in the air compressor, Comparison between reciprocating and rotary compressors, classification of rotary compressors, roots blower compressor, vane blower compressor, centrifugal compressor, comparison between centrifugal and axial compressor

Fuels and combustion: Types of fuel, combustion of solid and liquid fuels, minimum air required for complete combustion of solid or liquid fuels, combustion of gaseous fuel, minimum air required for

complete combustion of gaseous fuel, mass of excess air supplied, conversion of volumetric analysis into mass (gravimetric) analysis, conversion of mass analysis into volumetric analysis, flue gas analysis.

Term Work:

Part-I: Assignments

1. Numericals based on above syllabus
2. Record of at least three assignments preferably based on latest development in a particular field based on above syllabus. The students have to give a presentation on a selected topic in field of recent developments.

Part-II: Laboratory work

Conduct of following laboratory experiments (any eight)

1. Determination of flash and fire point of lubricating oil
2. Trial on reciprocating air compressor. This will consist of determination volumetric efficiency, determination free air delivered determination of mechanical efficiency.
3. Determination of calorific value of solid/liquid/gas fuel.
4. Analysis of flue gas (any one flue gas analyser)
5. Study of Babcock and Wilcox boiler.
6. Study of Lancashire boiler.
7. Study of Lamount boiler.
8. Study of boiler mountings and accessories.
9. Study of nozzle and diffuser
10. Study of condenser

Practical Examination:

- Practical examination consists of viva-voce/ oral by external examiner.

Reference Books:

1. R. K. Rajput, “Thermal Engineering”, Laxmi Publications Pvt. Ltd, New Delhi.
2. B. K. Sarkar, “Thermal Engineering”, Tata McGraw Hill Publishing Company Ltd. New Delhi.
3. P. K. Nag, “Engineering Thermodynamics”, Tata McGraw Hill Publishing Company Ltd. New Delhi.
4. P. L Ballany, “Thermal Engineering”, Khanna Publishers, New Delhi.
5. J. Selwin Rajadurai, “Thermodynamics and Thermal Engineering”, New Age International Publishers, New Delhi
6. D. S. Kumar, “Engineering Thermodynamics”, S. K. Kataria & Sons, New Delhi.

ME2341 – MANUFACTURING PROCESSES-I

(CREDITS THEORY: 03, PRACTICAL: 01)

Course code: ME2341 **Contact Hours /Week:** Th. 03, Pr.02

Course Objective:

- To understand the fundamentals and principles of casting, welding and certain metal working manufacturing processes.
- To understand the various machinery and equipment required to perform the processes.
- To understand and apprehend various applications of the manufacturing processes.

Evaluation Scheme:

Theory	Practical
Mid Term : 30 Marks	Continuous Evaluation : 50%
End Term : 70 Marks	Practical Examination : 50%

Course Content:

Introduction: Concept of Manufacturing Process, Classification of manufacturing processes.

Casting: Introduction to casting process and steps involved. Verities of component produced by casting process. Special molding and casting processes – Lost Foam Process, Shell Molding, Investment casting, Die casting, Centrifugal casting, and Continuous casting. Melting, Pouring and Feeding. Furnaces – Types – Cupola - Construction, operation, zones, Chemistry, etc. Gating system, advantages and limitations of casting process. Pattern Making, Molding and Casting : Sand casting, pattern types, materials, pattern making allowances, molding sand types, properties and testing, hand and machine molding process and equipments, core type and manufacturing**.** Design of casting: Solidification and Cooling, Riser and Gating design, design consideration in casting. Cleaning and Inspection of casting: Defects in casting. Inspection and Testing, NDT methods.

Processing of Plastics: Introduction of plastic molding, Various plastics molding processes and materials.

Welding: *Arc welding*: Theory, SMAW, GTAW, GMAW, FCAW, Submerged arc welding, Stud welding *Resistance welding*: Theory, spot and seam projection welding processes Gas welding Friction welding, Ultrasonic welding, Thermit welding, EBW and LASER welding. Use of adhesive for joining, classification of adhesives, types of adhesive and their application, surface preparation and various joints welding defects and quality.

Hot and Cold Working of Metals: Principles of rolling, forging, drop, press, upset, roll forging, extrusion, drawing, spinning, and effect of hot working. Cold working processes, Cold rolling, swaging, forging, extrusion- forward, backward and impact roll forming, tube drawing, wire drawing, spinning, shot penning, high energy rate forming.

Term Work:

The term work shall include numerical assignments and study assignments on below mentioned topics:

1. Study of Sand Testing Equipment's
2. Study of Cupola
3. Study of Casting
4. Study of NDT methods
5. Study of Arc Welding
6. Study of Gas Welding
7. Study of Processing of Plastics
8. Study of Metal working processes
9. Pattern making
10. Mould and Core Making
11. One Job on welding

(While writing study assignments it is desirable to visit laboratory/industrial set up in addition to referring the text and reference books.)

Practical Examination: It shall consist of oral examination based on above syllabus.

Reference Books:

1. P. N. Rao – "Manufacturing Technology (Foundry, Forming and Welding)" 2nd Edition (TMH)
2. Hajra Choudhary – "Elements of Workshop Technology- Vol. I Manufacturing Processes",
3. Chapman W.A.-"Workshop Technology, Vol. I, II, & III", Edward Arnold Pub. Ltd. London.
4. HMT Hand book- Production Technology
5. Roy A. & Linberg- "Processes and materials of manufacturing", Prentice Hall of India Delhi.
6. Campbell J.S.: Principles of Manufacturing Materials and Processes, McGraw-Hill, New York.
7. Begeman - "Manufacturing Processes", Asia Publishing House, Bombay.

ME2351 – ENGINEERING METALLURGY
(CREDITS THEORY: 03, PRACTICAL: 01)

Course code: ME2351 **Contact Hours /Week:** Th. 03, Pr.02

Course Objective:

- To understand the microstructure of different metals.
- To understand the different heat treatment processes.
- To understand the applications of powder metallurgy and composite materials.

Evaluation Scheme:

Theory	Practical
Mid Term : 30 Marks	Continuous Evaluation : 50%
End Term : 70 Marks	Practical Examination : 50%

Course Content:

Introduction: Pig iron Production, Manufacture of steel, by Basic oxygen steel making, Electric Arc steel making. Introduction to phase diagram.

Steel as an Engineering Alloy: Iron –Iron carbide equilibrium diagram, non-equilibrium cooling of steels, classification and applications of steel, specifications of steel, transformation products of austenite, time Temperature transformation (TTT) diagrams, Austenite and ferritic grain size in steels.

Cast Iron: White C.I. Gray C.I. malleable C.I., Nodular cast iron, Alloy cast irons and heat treatment of cast irons.

Heat Treatment of Steel: Conventional annealing, Bright annealing, box annealing, Isothermal (cycle) annealing, Spherodised annealing, Subcritical annealing, Normalising, Hardening, Retention of austenite, Effect of retained austenite, elimination of retained austenite, Tempering, Secondary hardening, Temper brittleness, Quench cracks, Hardenability, Carburizing, Selective carburizing, heat treatment after carburizing, Nitriding, Carbo-nitriding, flame hardening, Induction hardening.

Engineering Non-Ferrous Metals: Copper and copper alloys, Brasses, Aluminum and Aluminum alloys, Nickel and Nickel alloys, Tin and tin alloys and Bearing materials.

Powder Metallurgy: Introduction, characterization and testing of metal powders, powder manufacture, powder conditioning, Oil impregnated bearings, cemented carbide, cermets, advantages and limitations of powder metallurgy.

Composite Materials: Different composite materials and its application in manufacturing processes.

Term Work:

The term - work shall consist of a journal based on the below mentioned laboratory experiments/study (any eight).

1. Study of Metallurgical Microscope.
2. Preparation of Specimen for microscopic examination.

3. Heat Treatment of PCS and determine change in percentage of hardness and grain structure.
4. Study of microstructure of plain carbon steels of various compositions.
5. Study of microstructure of various types of C.I.
6. Study of microstructure of various types of alloy steels.
7. Study of microstructure of non – ferrous metals and their alloys.
8. Surface hardening and study of microstructure (study expt.)
9. Study of I.S. codes of steels and selection procedure.

Practical Examination: It shall consist of oral examination based on above syllabus.

Reference Books:

1. Sidney H. Avner, "Introduction to Physical Metallurgy",Tata McGraw-Hill Education, 1997
2. R. Higgnis, "Engineering Metallurgy Applied Physical Metallurgy, Sixth Edition,Butterworth-Heinemann.
3. V. Raghavan, "Physical Metallurgy Principles and practice".

ME2361 – MACHINE DRAWING AND COMPUTER AIDED DRAFTING
(CREDITS THEORY: 02, PRACTICAL: 01)

Course code: ME2361 **Contact Hours/Week:** Th.02, Pr.02

Course Objective:

- To understand the principles and requirements of production drawings.
- To understand the various symbols used in drawing.
- To understand Assembly drawings and details.
- To understand the concept of Bill of Materials.

Evaluation Scheme:

Theory	Practical
Mid Term : 30 Marks	Continuous Evaluation : 50%
End Term : 70 Marks	Practical Examination : 50%

Course Content:

Introduction: Introduction to machine drawing, Computer aided drafting and documentation (CADD)

Conventions: Conventional representation of standard machine parts, thread profiles and welded joints along with their actual drawings, Conventional representation for various types of springs and gears. Representing limits, fits and tolerances, Representation of Surface Roughness and Textures.

Production Drawing: Introduction, Types of production drawings, Detailing or Part Drawings, Working Assembly Drawings, Examples

Machine Parts: Screwed Fastenings: Locking Arrangement of Nuts, Foundation Bolts. Pipe Joints: Flanged, Socket and Spigot Joints, Hydraulic, Union Joints, Expansion Joints and Stuffing Box. Riveted Joints: Single and Double Riveted Butt and Lap Joints, Keys, Cotter Joints; Knuckle Joint.

Assembly and Detail Drawing: Assembly and detail drawing with complete dimensioning, tolerance, materials and surface finish of different small machines and machine components.

Computer Aided Drafting and Documentation (CADD): Introduction, Required Equipment, Starting AutoCAD, planning for a drawing, types of modeling, Isometric drawing, Basic dimensioning

Term Work:

The term work shall consist of record of Computer aided drafting assignments, drawing sheets and sketchbook based on the above syllabus.

Practical Examination:

End Term Examination shall be a practical/oral examination.

Reference Books:

1. Machine Drawing -N.D. Bhatt & V.M. Panchal, Charotar Publishing House, 2001

2. Machine Drawing –Siddheswar, Kannaiyah, and Shastry VVS, TMH
3. Machine Drawing with AutoCAD – G. Pohit and G. Ghosh, Pearson Education, 2005
4. P.S. Gill, Machine Drawing - S. K. Kataria and Sons, Delhi, 2002
5. Junnarkar ND, Machine Drawing, Pearson Education, 2005
6. Tutorials, manuals and documentation of CAD software.

ME2411 – ENGINEERING MATHEMATICS IV

(Theory: 04 CREDITS)

Course code: ME2411 **Contact Hours/Week:**Th.03, T.01

Evaluation Scheme:

Theory	Practical
Mid Term: 30 Marks	---
End Term: 70 Marks	---

Course Content:

Statistics and Probability: Role of statistics in engineering, Moments: Moments about mean moments about the mean in terms of moments about any point, skewness and kurtosis, introduction of correlation, regression coefficients, lines of regressions.

Probability distribution, discrete and continuous probability distribution, Binomial, Poisson and normal distribution and its applications and importance in engineering field.

Vector Calculus: Introduction of vector algebra, Limit, Continuity, derivative of a vector function, curves Tangents and arc lengths. Velocity and acceleration, radial and transverse components of velocity and acceleration, tangential and normal acceleration, scalar and velocity point functions, gradient of a scalar field, Directional derivative, divergence of a vector field, curl of a vector field. Line integrals, green's theorem in the plane, surface integrals, divergence theorem, Stoke's theorem.

Numerical Solution of Ordinary Differential Equations: Picard's Method, Euler's Method, improved and modified Euler's Method and Runge –Kutta Method.

References Books:

1. Advanced Engineering Mathematics, (Eighth Edition) By : Erwin Kreyszig. Pub. : John Wiley & Sons.
2. Introductory Methods of Numerical Analysis, By :S.S.Sastry. Pub. : Prentice-Hall of India New Delhi.
3. Advanced Engineering Mathematics, (Second Edition) By : R. K. Jain and S. R. K. Iyengar. Narosa Publication House.Probability By J.Pitman (1993) Pub. : Narosa Publication House.
4. Applied Statistics And Probability For Engineers: third edition, Wiley& sons (Asia) 2003.
5. A First Course In Probability, Second Edition (2003) by J. K. Chandra and D. Chatterjee, Narosa publication house.

ME2421 – THEORY OF MACHINES
(CREDITS THEORY: 04, PRACTICAL: 01)

Course code: ME2421 **Contact Hours/Week:** Th: 04, Pr.02

Course Objective:

- To understand commonly used mechanisms for industrial applications.
- To develop competency in drawing velocity and acceleration diagrams for simple and complex mechanisms.
- To understand the concepts of motion transmission elements.

Evaluation Scheme:

Theory	Practical
Mid Term: 30 Marks	Continuous Evaluation: 50 %
End Term: 70 Marks	Practical Examination: 50 %

Course Content:

Basic concept: Links, Kinematics pairs, Kinematics pairs giving one, two & three degrees of freedom, Kinematics chains, Degree of freedom & mobility criteria. Constrained kinematics chains as mechanisms. Inversions of four bar chains. Inversions of single & double slider crank chain & their applications.

Motion Characteristics of Mechanisms: Velocity & Acceleration analysis of mechanisms with single degree of freedom system using graphical method. Instantaneous Center, Kennedy's theorem, analysis of velocity of mechanisms using instantaneous centre method. Short cut methods- Klien's, Bennetts& Ritterheu's construction. Inertia force diagrams- dynamical equivalent systems

Cams: Introduction, Types of Cams, Types of followers, Follower motions, viz. Simple Harmonic Motion, Constant Velocity, Uniform Acceleration & Retardation, Cycloidal motion, layout of Cam profile for specified displacement characteristics. Cams with Oscillating follower system.

Gears: Classification, Gear Terminology, Law of Gearing, profiles used in gears, Length of path of contact, Arc of contact, contact ratio, Interference of involutes teeth, methods of preventing interference & under cutting.

Flywheel & Governors: -Turning Moment Diagram for single cylinder & multi-cylinder engine, Flywheel and its applications. Introduction, types of governors- Porter, Proell&Hartnell governor.

Gyroscope: Gyroscope couple and precision stabilization of ships & Air craft's only.

Practical's/ Assignments:

List of Experiments:

1. Compound pendulum.

2. Study of at least Four inversions of each single slider & Double slider crankMechanisms

3. To generate gear tooth profile and to study the effect of under cutting and rack shift using model.

4. To draw cam profile for various types of follower motion.

5. Experimental study of Governors.

6. Determination of Gyroscopic Couple of a Uniform disc.

List of Assignments.

1. Graphical solution to problems on velocity acceleration in mechanism by relative

velocity and acceleration method including problem with Carioli's component of Acceleration

At least 5 assignments based on the syllabus(Numerical and graphical solutions to be included)

2. Velocity by instantaneous centre method.

3. Klein's construction for slider cranks mechanisms.

4. Inertia forces analysis with graphical method.

5. At least Two sheets consisting of 4 problems on Cams.

Term Work:

The term work shall consist of record of assignments, drawing sheets and sketchbook based on the above syllabus.

Reference Books:

1. Bevan T., "Theory of Machines: a text book for engineering students", 3 rd Edition, CBS, New Delhi.
2. Rattan, S.S.: "Theory of Machines", 2 nd Edition, Tata McGraw-Hill, Publishing Co. Ltd., New Delhi, 2006.
3. Ballaney, P. "Theory if Machines and Mechanisms", Khanna Publications.
4. UickerJr, J. J., Penock G. R. and Shigley, J. E. "Theory of Machines and Mechanisms' 3 rd Edition, Oxford University Press, Tata McGraw Hill. 2005.
5. Ghosh, A, and Malick, A. K. "Theory of Mechanisms and Machines" 3 rd Edition, East West Press Pvt. Ltd., 2000.
6. Rao, J.S., and Dukkipati, R.V.: "Mechanism and Machine Theory", Wiley Eastern Ltd.

ME2431 – MECHANICAL MEASUREMENTS AND METROLOGY
(CREDITS THEORY: 04, PRACTICAL: 01)

Course code: ME2431 Contact Hours/Week: Th.04, Pr.02

Course Objective:

- To understand the basic principles, construction and working of engineering mechanical measurement science.
- To acquire proficiency in using, calibrating various measurement systems.
- To understand the problems in measurement system and develop the competency to resolve the problems.
- To know all the measuring instruments and to measure different parameters in day-today work.

Evaluation Scheme:

Theory	Practical
Mid Term: 30 Marks	Continuous Evaluation: 50 %
End Term: 70 Marks	Practical Examination: 50 %

Course Content:

MECHANICAL MEASUREMENTS:

Mechanical Measurement: Need of mechanical measurement, Instruments, Measurement methods, Generalized measurement system, Static performance characteristics, Errors and their classification.

Transducers: Classification and various types of transducers

Measurement of strain: Introduction, classification of strain gauges, Gauge factor, Temperature compensation, Quarter, Half and Full Bridge circuit, Application to measurement of load/force, Torque.

Measurement of Pressure: importance of pressure and vacuum measurement, Range of high pressure and vacuum, Bourdon tubes, Dead weight pressure gauge testers, Diaphragm gauge, LVDT, Piezoelectric pressure gauge, MCLeod gauge, Thermal conductivity gauge.

Measurement of flow: Importance of flow measurement,Water meter, Turbine meter, Rota meter, Air/Gas flow meter, Hot wire anemometer, Electromagnetic flow meter, Venturimeter, Pitot tube..

Temperature Measurement: Importance of Temperature Measurement,Thermometers, Themisters, Thermocouples and its laws, Pyrometers.

Speed Measurement: Importance of Angular Speed Measurement,Tachometer-Mechanical and Eddy current type, Mechanical counter, Stroboscope, Non-contact type counters-Inductive pickup, capacitive pickup and photoelectric pickup.

METROLOGY:

Introduction: Definition, Linear measurement – Standards, Classification of standards, Vanier calliper, Height gauge, Depth gauge, Feeler gauge, Slip gauge, Micrometer.

Limits, Fits and Gauges : Terminology, Definitions, Hole basis and Shaft basis system, Limit, Fits,

Tolerances, Taylor's principle of gauge design, Principles of gauge design (Simple numericalproblems on limits of size, tolerances etc.), Types of gauges, Interchangeability, Selective assembly. **Comparators:** Types and working principles of mechanical, pneumatic, electronic, optical, electrical comparators and their applications.

Interferometry: Principles of interferometry, Sources of light, Optical flat, Fringe patterns, Toolmakers microscope, Profile projector.

Surface Finish Measurement: Definitions, Surface texture terminology, Measurement of surface roughness, Symbols and values of surface roughness.

Angular Measurement: Bevel protractor, Sine bar, Sine center and table, Angle gauge, Clinometer,

Autocollimator, Angle dekkor.

Metrology of Screw Threads / Gear Metrology: Screw thread terminology, Screw thread micrometer, Floating carriage micrometer.

Gear terminology, Measurement of tooth thickness by gear tooth vernier caliper.

Advances in Metrology: Universal Measuring, Applications of LASER in measurement, Metro scope, Automatic inspection system.

Practical Work:

Mechanical Measurement (Any five)

1) Study of Generalized Measurement System with typical instrument.

2) Temperature measurement using Thermocouple, Themister and Pyrometers.

3) Experiment on pressure measurement:- U-tube manometer, Bourdon tube, DeadWeight tester.

4) Flow measurement using Rota meter / Water meter.

5) Angular speed measurement using stroboscope, pickups and tachometers.

6) Experiment on Force / Torque measuring instruments:- Spring balance, Proving ring, Dynamometer.

7) Study of LVDT.

Metrology (Any five)

1) Study of precision measuring instruments for linear measurement.

2) Study of comparator of different types.

3) Experiment on sine bar for measurement of taper angle.

4) Study of autocollimator/angle dekkor

5) Study and applications profile projector and Tool maker's microscope.

6) Measurement of screw thread using floating carriage micrometer.

7) Measurement of gear tooth thickness by gear tooth vernier caliper.

8) Assignment on design of gauges.

Practical Examination:

End Term Examination shall be a practical/oral examination.

Reference Books:

1. Beckwith & Buck, Mechanical Measurement,- McGraw Hill publication,2009.
2. Donald P. Eckman, Industrial Instrumentation,Wiley eastern Ltd.
3. Dobler, Metrology,Tata McGraw Hill Co. New Delhi.
4. D.S. Kumar, Mechanical Measurement and control, Metropolitan Book Company, 1979
5. R. .K Jain, Mechanical Measurement, - Khanna publication, New Delhi.

ME 2441-FLUID MECHANICS

(CREDITS THEORY: 03, PRACTICAL: 01)

Course code: ME2441 **Contact Hours /Week:** Th. 03, Pr.02

Course Objective:

- To understand fundamentals of fluid statics, fluid kinematics & dynamics of fluid flow.
- To understand fluid-flow phenomena observed in mechanical engineering systems.
- To develop a student's skills in analyzing fluid flows
- To understand the basics required for advance course like CFD

Evaluation Scheme:

Theory	Practical
Mid Term: 30 Marks	Continuous Evaluation: 50 %
End Term: 70 Marks	Practical Examination: 50 %

Course content:

Introduction: Definition of fluid, Properties of fluids, Viscosity, Compressibility, Bulk modulus of elasticity, Surface tension and capillarity

Fluid Statics: Pressure at a point, Pascal's law, Hydrostatic pressure on plane and curved surfaces, Pressure diagram on dams, Gates, Absolute, Gauge, Atmospheric and vacuum pressures, pressures, Measurement of pressure by manometers and gauges, Buoyant equations Buoyance, Centre of buoyancy, Stability of floating bodies, Metacentre, Metacentric height and its determination.

Fluid Kinematic: Types of fluid flows: Steady, Unsteady, Uniform and non-uniform, laminar and turbulent, Compressible and incompressible, rotational and irrotational, Rate of flows, continuity equation for one dimensional, Velocity and acceleration, Velocity potential function and stream function, vortex flow.

Fluid Dynamics: Equation of motion, Euler's equation, Bernoulli's equation, and practical applications of Bernoulli's equation: Venturi meter, orifice meter, Pitot tube, Momentum equation. Fluid mass subjected to uniform laminar and radial acceleration. Free and forced vortex flow, Radial flow, Navier Stokes equation.

Flow Through Pipes: Energy losses through pipe-Major and Minor losses, pipes in series, pipes in parallel and concept of equivalent pipe, Moody's diagram, Siphons, Transmission of power through pipes.

Dimensional Analysis: Dimensions of Physical Quantities, dimensional homogeneity, Buckingham π Theorem, important dimensionless numbers, Model analysis (Reynolds, Froude and Mach etc.).

Boundary Layer Flow: The boundary layer concept, the boundary layer thickness, displacement thickness, momentum thickness, growth of boundary layer, laminar & turbulent boundary layers. Momentum integral equation. Use of momentum integral equation for flow with zero pressure gradients: laminar flow & turbulent flow. Pressure gradients in boundary layer flows. Fluid flow about immersed bodies: flow over flat plate parallel and normal to the flow, friction drag, pressure drag,

flow over sphere and cylinder.

Term Work:

Part-I Assignments

Numerical based on above syllabus.

Part-II laboratory work

1. Study of pressure measuring devices.
2. Verification of Bernoulli's equation.
3. Calibration of Venturimeter.
4. Determination of Hydraulic Coefficients for an orifice.
5. Laminar and Turbulent flows by Reynolds's apparatus.
6. Major & Minor losses on pipe.

Practical Examination:

Practical examination consists of viva-voce/ oral by external examiner.

Reference Book:

1. Modi and Seth, "Hydraulics and Fluid Mechanics", Rajsons publication Pvt.Ltd.
2. Dr. R. K. Bansal, "Fluid mechanics and hydraulic machines", Firewall Media, 2005
3. C.P.Kothandraman," Basics of fluid mechanics", New Age publications.
4. K. R. Arora, "Fluid mechanics and hydraulic machines", standard Publications and dist.2005.
5. Dr. D. S. Kumar, "Fluid mechanics and hydraulic machines", KatsonsBook,New Delhi.
6. R. K. Rajput, "Fluid mechanics and hydraulic machines", S. Chand Publications.

ME2341 – MANUFACTURING PROCESSES-II

(CREDITS THEORY: 03, PRACTICAL: 01)

Course code: ME2451 **Contact Hours:** Th. 03, Pr.02

Course Objective:

- To understand the fundamentals of metal cutting process.
- To understand the concepts of different machining processes.
- To understand construction, working and applications of various machine tools.
- To understand the concepts and working of nonconventional machining process.

Evaluation Scheme:

Theory	Practical
Mid Term: 30 Marks	Continuous Evaluation :50 %
End Term:70 Marks	Practical Examination : 50 %

Course Content:

Introduction: Definition, principles, types, components, machining parameters, drives and power requirements.

Theory of Metal Cutting: Metal cutting process, Orthogonal cutting and force diagram, Tool geometry of single point cutting tool, tool signature, Merchant's circle, Force measurement by dynamometers, effect of tool angles on machining, Tool materials - properties, selection and applications. Chip-formation, types of chips, built-up-edge, chip breakers. Cutting Tool Materials, Machinability, Factors affecting machinability index, Tool Life, Factors affecting tool life, Taylor's equation, types of tool failures, tool wears, Tool condition monitoring.

Turning: Turning and Boring, Lathe: construction, accessories and operations, concept of speed, feed and depth of cut, Thread cutting: single and multi-start threading. Introduction to Boring Machines, Capstan and Turret lathe.

Drilling: Fundamentals of drilling processes, introduction to multi-point cutting tools, drill geometry, tool holder, types of drill, types of drilling machines, operations performed on drilling machines. Reaming processes and reamer types.

Milling, Shaping and Planing: Fundamental aspects, cutter types and geometry, Operations performed on milling machine, dividing head method of indexing. Construction, working and operations performed on shaper, planer, and broaching machines, Introduction to Gear Manufacturing.

Finishing and Super Finishing: Grinding wheels, wheel marking, wheel selection, wheel mounting, types of grinding machines. Honing, lapping, super finishing, buffing and burnishing processes

Non-Conventional Machining: Introduction, Classification. Principle, Working and Applications of Chemical Machining, Electrochemical Machining, Electric Discharge Machining (EDM), Wirecut EDM, Abrasive Jet Machining and types, Laser Beam Machining, Plasma Arc Cutting.

Term Work:

Each candidate shall be required to complete and submit the following term work.

Part A: One composite job consisting of Turning, Facing, Threading, Parting, Drilling and Boring operations.

Part B: One job should be made on any one non-conventional machining process.

Practical Examination:

The practical examination consists of an oral based on the term work prescribed above.

Reference Books:

1. Chapman W.A.-"Workshop Technology", vol. II, II, & IV, Edward Arnold pub. Ltd. London.
2. P. N. Rao – "Manufacturing Technology Vol-II " 2nd edition (TMH).
3. R. K. Jain, 'Production Technology', Khanna Publications.
4. Amitabha Ghosh and Asok Kumar Mallik, Manufacturing Science, 1985, Affiliated East West Press Pvt. Ltd., New Delhi.
5. Hajra Choudhary – "Elements of workshop technology- vol. I & II manufacturing processes".

ME 2461-COST ESTIMATION
(CREDITS PRACTICAL: 01)

Course code: ME2461 **Contact Hours /Week:** Pr.02

Course Objective:

- To understand various components of manufacturing cost.
- To understand various estimation of manufacturing cost for various manufacturing processes.
- To understand the concept of depreciation.

Evaluation Scheme:

Theory	Practical
--	Continuous Evaluation: 50 %
--	Practical Examination: 50 %

Course content:

Costing and Estimation: Functions and procedure Introduction to costs, Computing material cost, Direct labor cost, Analysis of overhead costs- Factory expenses/ Administrative expenses Selling and distributing expenses- Cost Structure - Cost of product-Depreciation Analysis of depreciation, Brake even analysis.

Estimation of Machining Times and Costs: Estimation of machining time of lathe operations Estimation of machining time of drilling, Boring, shaping, planning milling and grinding operations Illustrative examples.

Estimation of Costs in Fabrication Shops: Estimation in welding shop - Gas cutting electric welding – Illustrative example, Estimation in sheet metal shop- Shearing and forming- Illustrative examples.

Estimation of Costs in Different Shops: Estimation in foundry shop- Pattern cost – Casting cost Illustrative examples Estimation in Forging shop- Losses in forging- Forging cost- Illustrative examples.

Term Work:

Records of assignment based on above syllabus.

Practical Examination:

Practical examination consists of viva-voce/ oral by external examiner.

Reference Books:

1. Aditha, M. S. and Pabla, Estimating and costing, Konark publishers Pvt., Ltd
2. Banga T. R. and Sharma S.C. Estimating and costing, Khanna Publishers, New Delhi.
3. D. Kannapan et.al.,” Mechanical Estimation and Costing”, TTTI, Madras
4. B. P. Sinha, “Mechanical Estimation and Costing”.
5. E. M. Malstrom Manufacturing cost engineering handbook, Marcel Dekker

ME 2471-COMMUNICATION SKILL
(CREDITS PRACTICAL: 01)

Course code: ME2471 **Contact Hours /Week:** Pr.02

Course Objective:

- The main objective of this course is to prepare the engineering students for future career, further studies through development of listening, reading,writing and speaking skills.
- To help the students to get intra personal skills.
- To help students to gain stage daring and ability to work in teams.

Evaluation Scheme:

Theory	Practical
--	Continuous Evaluation: 50 %
--	Practical Examination: 50 %

Course content:

What is communication- need, importance, types, and objectives. Communication process & barriers. Principles of effective communication, Personality Development, SOWT Analysis, Stress Management, Building Positive Attitude, etc.

1. Modes of communication.
2. Practice of effective communication through eye contact, voice modulation, audience awareness, presentation plan and verbal & non-verbal Communication.
3. Face to face conversation with body language.
4. Understanding guidelines for telephonic conversation, making and receiving calls, telephonic messages.
5. Interviews Skills for employment – Preparing -Group Interview, Lunch / Dinner Interview,Telephonic Interview, self and reporting for sample questions on educational background, co-curricular activities, extra-curricular activities, experience, and general knowledge, miscellaneous.
6. Technical Guidelines for Communication - Hyphenated words, Use of Apostrophe, Abbreviations, Units, etc.
7. Meetings: understanding role and importance of procedure, chairmanship, participation, and physical arrangements, rules for successful meeting- experience sharing and reporting.
8. Group Discussions, Seminars and Conferences- Understanding different aspects-experience sharing and reporting.
9. Practice of public speaking with use of audio – Visual and Graphic aids, experience sharing and reporting.

10. Paragraph writing – Understanding principles, general hints writing and analyzing (practisingparagraph writing on 3-5 topics)
11. Understanding the principles and practice of – office drafting, circular, notices, memos, and telex/telegraph/email messages. Application resumes, sales enquiry, reply order, complaint Reports, feasibility report, analytical report, progress report, project report, inspect of damage and losses etc.
12. Preparation of notices, agenda, minutes etc.
13. Grammar – Articles, Tenses, The Preposition, Choice of Words and Phrases,Words commonly Misspelt, Confusing words and Expressions, etc.
14. Phonetics – Pronunciation, Articulation of sounds structure of syllable stress, rhythm, connected speech, intonation, clarity and pitch.
15. Use of integrated skills of communication.

Term Work and Reporting:

1. Term work will be in the form of Report containing minimum 10-12 exercises based on separate topics as mentioned in the syllabus.
2. The assessment will be made by the concerned teacher or an internal examiner appointed by the Principal of the College.

Reference Books:

1. Krishna Mohan and Meera Banerjee, “Developing Communication Skill”, McMillan Publishers.
2. B.V. Pathak, “Communication Skill”, NiraliPrakashan.
3. “Writing Correct English” – Readers Digest Publication.
4. Sunita Mishra, C. Murlikrishna, “Communication Skills for Engineers,”
5. “Professional Communication Skills” by S. Chand publication.
6. Krishna Mohan, MeeraBanerji, “Developing Communication Skills”
7. Rajesh K. Lidiya, “Communicative Grammar and Composition”