SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY
"DYANTEERTH", VISHNUPURI, NANDED

SYLLABUS FOR
S.E. (MECHANICAL ENGINEERING)

w.e.f. 2015-16

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSIT, NANDED

Teaching & Examination Scheme for Second Year Mechanical Engineering
w.e.f. 2015-16

Sem - III

Course Code	Subject	Teaching Scheme			Examination Scheme					Credits		
		Th	Pr/ Tut	Total	ESE	MSE	CE Pr / WS	ESE	Total	Th	Pr	Total
M-201	Engineering Math-III	04	-	04	80	20	-	-	100	04	-	04
M-202	Engineering Thermodynamics	04	02	06	80	20	30	70	200	04	1	05
M-203	Engineering Metallurgy	04	02	06	80	20	30	70	200	04	1	05
M-204	Mechanical Measurement & Metrology	04	02	06	80	20	30	70	200	04	1	05
M-205	Strength of Material	04	02	06	80	20	30	70	200	04	1	05
	Total	**20**	**08**	**28**	**400**	**100**	**120**	**280**	**900**	**20**	**4**	**24**

Sem-IV

Course Code	Subject	Teaching Scheme			Examination Scheme					Credits		
		Th	Pr/ Tut	Total	ESE	MSE	CE Pr / WS	ESE	Total	Th	Pr	Total
M-206	Engineering Math-IV	04	-	04	80	20	-	-	100	04	-	04
M-207	Theory of Machine	04	02	06	80	20	30	70	200	04	1	05
M-208	Manufacturing Technology – I	04	02	06	80	20	30	70	200	04	1	05
M-209	Fluid Mechanics & Hydraulics Machines	04	02	06	80	20	30	70	200	04	1	05
M-210	Machine Design & CAD	04	02	06	80	20	30	70	200	04	1	05
M-211	Communication Skills	02	02	04	40	10	50	-	100	-	-	-
	Total	**22**	**10**	**32**	**440**	**110**	**170**	**280**	**1000**	**20**	**4**	**24**

CE – Continuous Evaluation   **ESE – End Semester Exam**
MSE – Mid Semester Exam   **Pr. – Practical**
Th – Theory   **Tut – Tutorial**   **W/S- Workshop**

S. E. (Mechanical) Part - I
M-201 – Engineering Mathematics - III
Teaching Scheme   **Examination Scheme**
Theory: 4 Hrs/Week   MSE: 20 Marks
                                                                        ESE: 80 Marks

Course Objective

i) To develop logical understanding of the subject.

ii) To develop mathematical skill so that students are able to apply mathematical methods & principals in solving problem from Engineering fields.

iii) To make aware students about the importance and symbiosis between Mathematics and Engineering.

Course Outcomes

i) Student will demonstrate basic knowledge of L.D.E.,P.D.E.,Vector & F.T.

ii) Student will show the understanding of impact of Engg.Mathematics on Mech.

iii) Student will Demonstrate their understanding of mathematical ideas from multiple perspectives, such as by (a) using the internal connections between geometry, algebra, and numerical computation, (b) applying the connections between theory and applications, or (c) distinguishing between a formal proof and a less formal arguments and understanding the different roles these play in mathematics.

Unit-I Linear Differential Equation of Higher order   (08 Hrs)
Introduction to Linear Differential Equation of nth order with constant coefficients
Methods of solving Linear Differential Equation with constant coefficients
a) Shortcut Method
b) Variation of Parameter Method
Equation reducible to Linear Differential Equation with constant coefficients
a) Cauchy's Equation
b) Legendre's Equation
Application of Linear Differential Equations to whirling of shaft.

Unit-II Vector Differentiation   (07 Hrs)
Vector and Scalar point function, Differentiation of vector point function, vector differential operator, gradient of scalar point function, directional derivative, divergence of vector point function, solenoidal vector field, irrotational and conservative field, second order differential operator and vector identities (only problems)

Unit-III Vector Integration   (08 Hrs)
Line integral in Cartesian, polar and parametric form, work done, line integral independent of path, Green's theorem (without proof), its verification and application, surface integral, Stoke's theorem (without proof) and applications, volume integral, Gauss divergence theorems (without proof), and applications.

Unit-IV Fourier Transform (07 Hrs)

Fourier integral, Fourier sine and cosine integral, complex forms of Fourier integral, Fourier transform, Fourier sine and cosine transform –Fourier sine and cosine transform, Properties of Fourier transform, Parseval"s identity for Fourier transform.

Unit-V Partial Differential Equation (08 Hrs)

Introduction to partial differential equation, Solution of partial differential equation by Method of Separation of Varibles, Application of partial differential equation to 1) one dimensional Wave Equaitons, ii) one dimensional heat flow equaitons

Unit –VI Probability Distribution (07 Hrs)

Random variables, discrete probability distribution continuous probability distribution.
Probability distribution: Poisson distribution,Fitting of poission distribution & its application.Normal Distribution& its application.

B.S.Grewal, Higher Engineering Mathematics, 43ʳᵈ edition, ISBN 9788174091955
Elementary Differential Equations and Boundary Value Problems By William E. Boyce,Richard C.DiPrima(9ᵗʰ Edition)
Jain and Iyenger, Advanced engineering Mathematics, Narosa Pub. House, New Delhi.
E. Kreszig, Advanced Engineering Mathematics, 6th edition, Wiley Eastern publication.

S. E. (Mechanical) Part - I
M-202 – Engineering Thermodynamics

Teaching Scheme	Examination Scheme
Theory: 4 Hrs/Week	MSE: 20 Marks
Practical: 2 Hrs/Week	ESE: 80 Marks
	CE: 30 Marks
	Practical Exam: 70 Marks

Course Objectives:

1. To understand the concept of quantity and quality of energy

2.To understand use of steam for power generation and process heating

3.To prepare the student to effectively use thermodynamics, in the practice of engineering.

4. To lay the ground work for subsequent studies in such fields as fluid mechanics, heat transfer etc.

Course outcomes:

At the end of course, the student will able to

1. Apply fundamental concepts of thermodynamic to solve real life engineering problems.

2. Identify problems & analyse power producing and consuming devices.

3. To apply fundamentals of engineering thermodynamics to compressors .

UNIT – I [04 Hrs]

First law of thermodynamics : Introduction to variable specific heat, First Law and its limitations, SFEE on Mass & Time basis and its applications.

UNIT – II [08 Hrs]

Second Law of Thermodynamics : Statements of Second Law & their equivalence, Corollaries, Carnot Cycle, Carnot Principle, Carnot Heat Engine, Carnot Refrigerator, Carnot Heat Pump, Available & Unavailable Energy, Decrease in Available Energy with heat transfer through finite temperature difference, Availability in Non-Flow & Flow Systems, Reversibility & Irreversibility.

UNIT – III [06 Hrs]

Entropy : Clausius Inequality, Increase–in–Entropy Principle, Entropy – a Property of System, Physical Significance of Entropy, Entropy Change of Solids & Liquids.

UNIT – IV [08 Hrs]

Properties of steam and vapour power cycles : Introduction to Steam Generation,Thermodynamic properties of steam & steam table, properties of wet & super heated steam,Measurement of dryness fraction of steam .Carnot vapour power cycle, drawback as a reference cycle, simple Rankine cycle, description, T-Sdiagram, analysis for performance , comparison of Carnot and Rankine cycles. Effect of pressureand temperature on Rankine cycle performance. Actual vapour power cycles. Methods to improveefficiency of Rankine cycle.

UNIT – V [08 Hrs]

Gas power cycles Cycles : Air standard cycle, Efficiency and mean effective pressure,

Thermodynamic Cycles such as Carnot, Rankine, Otto, Diesel, Dual and Brayton . (Analysis of above Cycles).

UNIT – VI [06 Hrs]

Air Compressor : Working of Single, Two, Three Stage Reciprocating Air Compressors,

Theoretical & Actual Indicator Diagrams, Indicated Power, Brake Power, Efficiencies,

Effect of Clearance on Volumetric Efficiency.

NOTE- Numerical Treatment is included for all UNITS.

Reference Books :

1.Yunus A. Cengle, Michael A Boles - Thermodynamics An Engineering Approach, Mc Graw Hill

Book Company

2. Sonntag, Borgnakke & Van Wylen - Fundamental of Thermodynamics, Wiley Publishing

3. P. K. Nag - Engineering Thermodynamics ,Tata Mc Graw Hill Publishing Co. Ltd.

4. P. L. Ballaney - Thermal Engineering (Khanna Publishers).

5. R. K. Rajput – Thermal Engineering, Laxmi Publications.

List Of Experiments:(Perform any 8 experimentation out of 11)

1. Study of Fire Tube Boiler.
2. Study of Water Tube Boiler.
3. Study of Boiler mounting And Accessories.
4. Study of Steam Calorimeter.
5. Trial on Air Compressor.
6. Experimental determination of Flash Point and Fire Point of Lubricant.
7. Study of steam Power plant.
8. Study of Bomb Calorimeter.
9. Study of Carburetor.
10. Study Of fuel pump and fuel injector.
11. Study of ignition system of I.C. engine

Practical Examination:

It shall consists of Actual/Trial and oral based on experiment assigned to candidate.

S. E. (Mechanical) Part-I
M-203 – ENGINEERING METALLURGY

Teaching Scheme	**Examination Scheme**
Theory: 4 Hrs/Week	MSE: 20 Marks
Practical: 2 Hrs/Week	ESE: 80 Marks
	CE : 30 Marks
	Practical Exam: 70 Marks

Course Objectives:

The syllabus of Engineering Metallurgy is designed with a view of providing the following to the students:

1. The basic structure of metals:- Their atomic arrangement, Crystalline   Morphology, Defects in the Crystal, Effects of Dislocations

2. Effects of Alloying and Heat Treatment on the Mechanical properties of metals.

3. Surface Treatments for selective surface hardening and Advanced Metallurgical processes like powder metallurgy.

4. Composite materials, Polymers and Super Alloys.

Course outcomes:

At the end of course, the student will able to

1. Apply fundamental concepts of Metallurgy to solve real life engineering problems.

2. Identify problems and suggest suitable material/ heat treatment to get the requisite mechanical properties for a given application.

3. To apply advanced Metallurgical techniques to solve numerous engineering problems

Unit - I: Metals & Their Structures: **5Hrs**

Classification of Materials.

Metallic materials, Polymeric Materials, Ceramics and Composites: Definition, general properties, Applications with Examples.

Lattice Imperfections

Crystal structure (BCC, FCC, HCP & BCT), Imperfection in crystals: Definition, classification and significance of imperfections; Point defects, line defects, edge and screw dislocations, surface defects, volume defects.

Deformation

Mechanism of Elastic and plastic deformation (slip and Twining), deformation of single crystal by slip, plastic deformation of polycrystalline materials, work hardening theory, changes in properties due to cold and hot working.

Unit - II: Alloy Steels: **8 Hrs**

Alloy formation

Significance of alloying, Effect of alloying elements on properties of steel,

Alloy formation by crystallization, nucleation, solidification and growth, cooling curves, Solid solutions and intermediate phases, Phase and Phase diagrams,

Construction of equilibrium diagrams, (Eutectic, Eutectoid, Peritectic transformations), dendritic structure and coring, detailed study of Iron Carbon diagram, Harden ability concept and tests.

Cast Iron

Types, Properties, Microstructure & Uses of different Cast Irons

Alloy Steels

Low carbon steel – Cold forming steel, DUAL phase steel.

Mild Steel – Conventional mild steel, free cutting steel.

Medium Carbon Steel : Spring steel.

High carbon steel – Structural steel, High Strength Low Alloy steel (HSLA), Ausformed steels, Maraging steels,Tool Steels, Stainless Steel.

Unit – III: Heat Treatment of Steel-I   **8 Hrs**

Annealing – Stress Relieving, Full annealing, ISO thermal annealing, Diffusion annealing, partial annealing, Recrystallization annealing, process annealing, Spherodising, and Homogenizing.

Normalizing – Normalizing V/s Annealing.

Hardening – Factors affecting, hardening methods, defects & Quenching stresses.

Tempering – Structural changes during tempering, effect of alloying elements on tempering, temper brittleness, Temper colors.

TTT – Curves & Effect of carbon on TTT-curves.

Austempering, Martemparing, Sub-zero treatment, Patenting. Quenching media, effect of carbon content & effect of alloying elements on TTT curves.

Unit - IV: Heat Treatment- II   **8 Hrs**

    Chemical Heat Treatment of Steel

    Carburising – Pack, Liquid and gas carburizing, vacuum carburizing. Post carburizing Heat Treatment, cyaniding V/s carbonitriding-cyaniding, carbonitording, Nitriding, plasma nitriding, salt bath nitriding, Nitro-carburising, boronizing, chromizing and Toyota diffusion process.

    Surface Hardening

    Flame hardening, Induction, Electron beam, Laser hardening, Case depth measurement in steel – Hardness method, Chemical method and macrostructure method and microscopic method.

Unit - V: Non-Ferrous Metals and :   **4 Hrs**

    Copper & its alloys, **Aluminum** & its alloys, **Magnesium** & its alloys, **Titanium** & its alloys & **Bearing metals**.

Unit - VI: Powder Metallurgy :   **4 Hrs**

    Basic steps of powder metallurgy process, powder manufacturing, characteristics of metal powders, secondary operations in powder metallurgy, advantages, disadvantages & applications.

Unit - VII: Advanced Materials   **3hrs**

Composite materials, Plastics, Ceramics, Bio-materials, Nano materials, Smart materials and their applications, Piezo electric and Ferro electric materials and their applications, Modern Materials for high, low temperatures and Cryogenic applications, superconductors

Practical Examination will be based on the above syllabus.

TERM WORK:

    Term work shall consist of journal based on following experiments (**at least 8**):

    (i) Study of metallurgical microscope.

    (ii) Preparation of specimen for microscopic examination.

    (iii) Heat treatment of PCS and determine percentage of hardness.

    (iv) Demonstration of N.D.T. (Any two different N.D.T. tests)

    (v) Study of microstructure of PCS of various compositions.

    (vi) Study of microstructure of various types of C.I.

    (vii) Study of microstructure of various types of Non-ferrous metals.

    (viii) Jominy end-quench test for hardenability.

    (ix) Surface hardening and study of microstructure.

(x) Observation of various industrial heat treatment processes during industrial visit.

PRACTICAL EXAMINATION :

It shall consist of practically identifying the given unknown specimen and oral based on the above prescribed syllabus.

REFERENCE BOOKS :

    (i) Material Science & Metallurgy for Engineers-Dr.V.D.Kotgire.

    (ii) Physical Metallurgy-Principles & Practice by-V.Raghavan.

    (iii) Introduction to Physical Metallurgy by-Sidney H. Avner.

    (iv) Physical Metallurgy by-Virendra Singh.

    (v) Heat Treatment Principles & Techniques by-T.V.Rajan, C.P.Sharma.

    (Vi) Engineering Metallurgy by – R.A.Higgins Part.

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S. E. (Mechanical) Part - I
M-204 – MECHANICAL MEASUREMENTS AND METROLOGY

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Teaching Scheme	Examination Scheme
Theory: 4 Hrs/Week	MSE: 20 Marks
Practical: 2 Hrs/Week	ESE: 80 Marks
	CE : 30 Marks
	Practical Exam: 70 Marks

Course Objectives:-
* 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.
* **Course Outcomes:**
* After going through basic study of generalized measurement system, students will be able to understand the stepwise working of all instruments and will be able to find out the output factors.
* They will be able to know the importance of all factors affecting on output of instruments i.e. errors.

- They can suggest some points in the design & working of instruments after studying the basics if metrology.
  - Students will be able to differentiate between all types of measurements i.e. Direct & indirect type, contact & non-contact type as well as they can design the components with provisions of tolerance in manufacturing through the concepts of metrology.

PART- A
Metrology

UNIT-1   08 Hours

Standards of measurement: Definition and Objectives of metrology, Standards of length-International prototype meter, Imperial standard yard, Wave length standard, subdivision of standards, line and end standard, Slip gauges, Wringing phenomena, Numerical problems on building of slip gauges. Vernier caliper, Height gauge, Depth gauge, Feeler gauge, Slip gauge, Micrometer.

System of Limits, Fits, Tolerance and Gauging: Definition of tolerance,Specification in assembly, Principle of interchangeability and selective assembly, limits of size, Indian standards, concept of limits of size and tolerances, compound tolerances, accumulation of tolerances, definition of fits, types of fits and their designation (IS 919-1963), geometrical tolerance, positional-tolerances, hole basis system, shaft basis system, classification of gauges, brief concept of design of gauges (Taylor's principles), Wear allowance on gauges, Types of gauges-plain plug gauge, ring gauge, snap gauge, limit gauge. Numerical problems on gauge design.

UNIT-2   06 Hours

Comparators: Introduction to comparators, characteristics, classification of comparators, mechanical comparators-   Johnson Mikrokator, sigma comparators, dial indicator, optical comparators principles, Zeiss ultra optimeter, electric and electronic comparators principles, LVDT, pneumatic comparators, back pressure gauges, solex comparators.

Angular measurement: Angular measurements, bevel protractor, sine principle and use of sine bars, sine centre, use of angle gauges, clinometers.

UNIT-3:   06 Hours

Surface Roughness: Sources of surface irregularities in manufacturing, Different elements of surface roughness, Definition of center line and related roughness parameters, Measurement Instruments.

Interferometry: Interferometry, interferometer, autocollimator, angle dekkor, Optical flats.

Screw thread and gear measurement: Terminology of screw threads,measurement of major diameter, minor diameter, pitch, angle and effectivediameter of screw threads by 2-wire and 3-wire methods, best sizewire. gear tooth terminology, use of geartoothVernier caliper and micrometer, Tool maker's microscope, profile projector, Introduction to Coordinate Measuring Machines.

PART-B
Mechanical Measurements

UNIT-4:   08 Hours

Measurements and measurement systems: Definition, significance ofmeasurement, generalized measurement system, definitions and concept ofaccuracy, precision, calibration, threshold, sensitivity, hysterisis,repeatability, linearity, loading effect, system response-times delay. Errorsin measurement, classification of errors.

Transducers: Transfer efficiency,primary and secondary transducers, electrical, mechanical, electronictransducers, advantages of each type transducers.

UNIT-5   06 Hours

Measurement of force, torque and pressure: Principle, analytical balance,platform balance, proving ring. Torque measurement, Prony brake,hydraulic dynamometer. Pressure measurements, principle, use of elasticmembers, Bridgeman gauge, McLeod gauge, Pirani gauge.

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

UNIT-6   06 Hours

Temperature and strain measurement: Resistance thermometers,thermocouple, law of thermocouple, materials used for construction,pyrometer, optical pyrometer.

Strain measurements: Introduction, Classification of strain gauges,Temperature compensation, Quarter, Half and Full Bridge circuit strain gauge, preparationand mounting of strain gauges, gauge factor, methods of strain measurement.

Speed Measurement: Importance of angular speed measurement, Tachometer-Mechanical and Eddy currenttype, Mechanical counter, Stroboscope, Non-contact type counters-Inductive pickup,capacitive pickup and photoelectric pickup.

Recommended Books:
1. Engineering Metrology by R. K. Jain – Khanna Publication.
2. Engineering Metrology by Hume K. J.
3. Metrology by Dobler – Tata McGraw Hill Co, New Delhi.
4. Industrial metrology: surfaces and roundness - Smith, G. T. Springer.
5. Engineering Metrology, I.C. Gupta, Dhanpat Rai Publications,Delhi.
6. Mechanical Measurement and control by D.S. Kumar
7. Mechanical Measurement by Beckwith & Buck - McGraw Hill publication
8. Mechanical Measurement by R.K Jain - Khanna publication, New delhi
9. Industrial Instrumentation – Donald P. Eckman – Wiley eastern Ltd.
10. Mechanical Measurement by Sorihi &Dr. Radnakrishnan.
11. Industrial Instrumentation, Alsutko, Jerry. D. Faulk, CengageAsia Pvt. Ltd. 2002.
12. Measurement Systems Applications and Design, Ernest O.Doebelin, 5th Ed., McGraw Hill Book Co.
13. Metrology & Measurement, Anand K. Bewoor & Vinay A.Kulkarni, Tata McGraw Hill Pvt. Ltd., Delhi

14. NPTEL courses, http://www.nptel.iitm.ac.in/courses.php?disciplineId=112

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 gauge design.

Mechanical Measurements (Any five)

1) Study of Generalized Measurement System with typical instrument.

2) Temperature measurement using Thermocouple, Thermister and Pyrometers.

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

4) Flow measurement using Rotameter / Watermeter.

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.

S. E. (Mechanical) Part - I
M-205 – Strength of Materials

Teaching Scheme	Examination Scheme
Teaching Scheme	**Examination Scheme**
Theory: 4 Hrs/Week	MSE: 20 Marks
Practical: 2 Hrs/Week	ESE: 80 Marks
	CE : 30 Marks
	Practical Exam: 70 Marks

Course Objectives:

- To establish an understanding of the fundamental concepts of mechanics of deformable solids; including static equilibrium, geometry of deformation, and material constitutive behavior.

- Mechanical behavior of the body by determining the stresses, strains and deflections produced by the loads up to the elastic limit.

- Fundamental concepts related to deformation, strain energy, moment of inertia, load carrying capacity, slope an deflection of beams, shear forces, bending moments, torsional moments, column and struts, principal stresses and strains and theories of failure.

- To provide students with exposure to the systematic methods for solving engineering problems in solid mechanics.

Course Outcomes:
Student will be able to understand the concepts of various stresses and their significant effects in context with engineering applications.

* Student will be able to effectively use the concepts of shear force and bending moment diagrams in design of machine elements.
* Will be able to compute the principal stresses and Strains by analytical and graphical methods (Mohr's circle of stress 2-D.
* Able to use expressions for estimation of deformation in axially loaded members under gradual, sudden and impact loads.
* Able to estimate the Slope and Deflection in determinate beams.
* This subject enables the student to understand the important concepts of stress and strain, their significance in concept with engineering applications and is useful while studying the subjects like, Machine Design, Theory of machines, Dynamics of Machines.

Unit 1 :   (6 hrs)
Simple stresses and strains: a) Concept of stress and strain (linear, lateral, shear and volumetric) Hooks law. Elastic constants and their relationship. Generalized Hook's law. Stresses, strains and deformation in determinate and indeterminate homogeneous and composite bars under concentrated loads, self-weight and temperature changes.

Unit 2 :   (8 hrs)
a) Shear force and bending moment diagrams: Concept and definition of shear force and Bending Moment in beams due to concentrated load, UDL, and couples in determinate beams. Relation between SF, BM and intensity of loading, construction of SF, and BM diagrams for cantilevers, simple compound beams .

b) Stresses due to bending: Theory of simple bending, concept and assumptions, Derivation of Flexure formula, Bending stress distribution diagram, Moment of resistance and section modules calculations.

Unit 3 :   (6 hrs)
a) Shear stress distribution in beams: Shear stresses concept, derivation of shear stress distribution formulae, shear stress distribution diagram for common symmetrical sections, maximum and average shear stress, shear connection between Flange and web.

b) Torsion of circular shaft: Theory of torsion of shafts of circular, cross section. Assumptions, Derivation of torsion formulae. Shafts of hollow, solid, homogeneous and composite circular cross section subjected to twisting moments, stresses due to combine torsion, bending and axial force on shafts.

Unit 4 :   (6 hrs)
a) Principal stresses and principal strain: Normal and shear stresses on any oblique planes and concept of principal planes and principal planes by analytical and graphical methods (Mohr's circle for a 2-D stress state).

 b) Pressure Vessels: Stresses, strains and deformation in thin walled seamless cylindrical and spherical vessels due to internal fluid pressure. Change in volume, effects of additional compressible or Incompressible Fluid injected under pressure.

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Unit 5 : (7 hrs)
 a) Axially loaded columns: Concept of critical load and buckling, Euler's formulae for buckling load , concept of equivalent length for various end conditions. Rankin's formulae, safe load on column, Limitations of Euler's formulae.
  b) Strain energy and impact. Concept of strain energy, derivation and use of expressions for deformation of axially loaded members under gradual sudden and impact loads.

Unit 6 : (7 hrs)
Slope and Deflection of Determinate Beams: a) Concept and definition, relation between B.M., slope and deflection,slope and deflection by double integration method (McCauley's method). b) Slope and Deflection in determinate beams.

Text Books:
- Ramamurtham, "Strength of Materials", Dhanpat Rai Publishing Company (P) Limited
- Beer and Johnston, "Strength of Materials" CSB Publisher

Reference Books:
- Gere &Timoshenko, "Mechanics of Material", CSB Publisher 1984
- E.P. Popov, "Introduction to Mechanics of solids", Prentice Hall Publication
- Singer and Pytel, "Strength of Materials", Harper and Row Publications
- Timoshenko and Young, "Strength of Materials", CSB Publisher

Course Outcomes:
- Students will be able to effectively utilize the knowledge obtained in theory in order to perform practical.
- Students will understand the effect of tensile, shearing force and can utilize the knowledge gained while tackling real life engineering problems.
- Students will be able to effectively incorporate the important concepts learnt while designing components.

List of Experiments:
1. Tension test on Mild Steel and Aluminum
2. Shear test on Mild Steel and Aluminum
3. Torsion test on Mild Steel and Cast-Iron
4. Impact test on Mild Steel, Aluminum and Cast-Iron
5. Hardness test on Mild Steel, Aluminum and Cast iron
6. Bending test on Timber,

M-206 – Engineering Mathematics - IV

Teaching Scheme	**Examination Scheme**
Theory: 4 Hrs/Week	MSE: 20 Marks
	ESE: 80 Marks

Course Objective

i)To develop logical understanding of the subject.

ii)To develop mathematical skill so that students are able to apply mathematical methods & principals in solving problem from Engineering fields.

iii)To make aware students about the importance and symbiosis between Mathematics and Engineering.

Course Outcomes

i)Student will demonstrate basic knowledge of Functions of Complex Variable & Numerical Technique.

ii)Student will show the understanding of impact of Engg.Mathematics on Mech.

iii) Student will Demonstrate their understanding of mathematical ideas from multiple perspectives, such as by (a) using the internal connections between geometry, algebra, and numerical computation, (b) applying the connections between theory and applications, or (c) distinguishing between a formal proof and a less formal arguments and understanding the different roles these play in mathematics.

Unit-I Function of a Complex Variable: (07 Hrs)

Introduction to Complex Numbers: Polar form of Complex Number. Relations between Circular function and Hyperbolic functions (only concepts no problems). Limits and continuity of complex functions, derivative of Complex functions, Analytic functions, C-R Equations in Cartesian and polar form, Harmonic function Construction of an analytic function only real or iginary parts are given by Milne Thomson Method.

Unit-II Complex Integration (07 Hrs)

Line Integral, Cauchy's integral theorem, Extension of Cauchy's integral theorem for multiply connected domain and Cauchy's integral formula, Taylor's and Laurent' series (only problems), Singularities and zeros of complex function, calculation of residue and residue theorem and its application to integration around unit circle.

Unit- III FINITE DIFFERENCES AND INTERPOLATION (07 Hrs)

Finite Differences :- 1) Forward
2) Backward
3) Central

Difference Operators: - Shift, Average, Relation between operators

Newtons Forward, Backward and Central (Only Stirling's formula) Interpolation Formulas.

UNIT IV NUMERICAL DIFFERENTIATION (06 Hrs)

Formulae for Derivatives
1) Derivatives using Forward Difference Formula
2) Derivatives using Backward Difference Formula
3) Derivatives using Central Difference Formula

Maxima & Minima of tabulated function.

UNIT V NUMERICAL INTEGRATION (06 Hrs)

Newtons cotes Quadrature Formula, Trapezoidal Rule, Simpson's One-Third Rule, Simpson's Three-Eighth Rule.

UNIT VI   NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS   (07 Hrs)
1) Picard's Method
2) Taylor's Series Method
3) Euler's Method & Euler's Modified Method
4) Runge-Kutta Method

B.S.Grewal, Higher Engineering Mathematics, 43rd edition, ISBN 9788174091955
Jain and Iyenger, Advanced engineering Mathematics, Narosa Pub. House, New Delhi.
E. Kreszig, Advanced Engineering Mathematics, 6th edition, Wiley Eastern publication.

S. E. (Mechanical) Part - II
M-207- Theory of Machines

Teaching Scheme   **Examination Scheme**
Theory: 4 Hrs/Week   MSE: 20 Marks
Practical: 2 Hrs/Week   ESE: 80 Marks
                                                       CE :   30 Marks
                                                       Practical Exam: 70 Marks

COURSE OBJECTIVES:

Mechanical devices are characterized by the fact that they have mobility and must move to function. This differentiates mechanical engineering from other fields of engineering such as civil engineering, in which structures are generally immobile, and electrical engineering, in which one is concerned with the motion of electrons and not structures. The study of kinematics and dynamics of machinery is an applied field of mechanical engineering that is concerned with understanding the relationship between the geometry and the motions of the parts of a machine and the forces that produce this motion. The overall objective of this course is to learn how to analyze the motions of mechanisms, design mechanisms to have given motions, and analyze forces in machines. This includes relative motion analysis and design of gears, gear trains, cams, and linkages, simultaneous graphical and analytical analysis of position, velocity, and acceleration, considering static and inertial forces.

COURSE OUTCOMES:

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

1. Identify the basic relations between distance, time, velocity, and acceleration.

2. Apply vector mechanics as a tool for problem solving techniques.

3. Distinguish the basics of kinematics and kinetics of motion.

4. Develop familiarity with application of kinematics theories to real-world machines.

5. Understand analytical linkage analysis.

6. Determine cam profiles.

7. Understand gear trains.

8. Use the techniques to study the motions of machines and their components.

9. Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Unit-I   6 hrs.

Simple Mechanisms

Kinematic link, Kinematic pairs &it's types, Kinematic chain, Types of kinematic joints, mechanism, machine, Degree of freedom, Kutzbech and Grubler's criterion.

Four bar chain & its inversions, Greshoff's law, Single slider crank chain and it's inversions, Double slider crank chain and it's inversions.

Steering gear mechanism – Davis steering gear mechanism & Ackermann steering gear mechanism, Condition for correct gearing.

Unit-II   10 hrs.

Velocity & Acceleration of mechanisms.

1) Relative velocity method- Relative velocity of a point on a link, Angular & sliding velocity, velocity polygon by Graphical method.

2) Acceleration polygons by Graphical method, Angular Acceleration of a link, coriolis component of Acceleration.

3) Kennedy's 3-center in line theorem, Space & Body centrode. Inst. centre of Rotation & types. Of I-centers,Method of locating ICR.velocity analysis of link by ICR method.

Unit-III   6 hrs.

CAMS - Types of cams, types of followers . Application, Generation of cam profile, Cams with specified contours, tangent cam with roller -reciprocating Follower, Circular arc cam with flat faced reciprocating follower.Velocity&accelration of followers.

Unit-IV   6 hrs

Turning moment Diagram & flywheel -Fluctuation of energy and fluction of speed in flywheels, Size of flywheel.

Unit-V   6 hrs.

Gyroscope- Gyroscopic couple, Analysis of forces on the bearing due to the forced precessing of rotating disc mounted on shafts.Effects of Gyro-couple on the stability of an automobile negotiating a curve, Gyroscopic stabilization, Gyroscopic effect on Aero plane & Naval ship.

Unit-VI   6 hrs.

Gears- Classification, Terminology, Law of gearing, profiles used in gears, comparison of involute &cycloidal profile, length of path of contact, No. of teeth in contact, sliding velocity of grars.

    Interference & Undercuttingof gears,Methods of preventing interference, Minimum no. of teeth on pinion to avoid interference, Minimum no of teeth on pinion for involute rack.

Gear trains- Classification, velocity ratio, Differential gear.(Analytical problems not to be covered.)

List of Experiments:-

1.Study of at least four inversions of single slider crank chain Mechanisms.

2. Study of Ackermenn& Davis steering gear Mechanism.

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

4. Study of Differential gear mechanism.

5. Determination of Gyroscopic Couple of a Uniform disc.

List of Drawing Sheets:
1. Graphical solution to problems on velocity, acceleration in mechanism, by relative velocity and acceleration method, including problem with Corioli's component of acceleration (at least 4 sheets on velocity & 4 sheets on acceleration diagram.)
2. Velocity by instantaneous center method.(4 sheet)
3. Klein's construction for slider cranks mechanisms.
4. At least two sheets consisting of 4 problems on Cams, for different type of motion of followers.

Text Books:-
      1}Rattan, S.S 'Theory of Machines", Tata MCGraw Hill.
      2} Ballaney,P.'Theory of Machines and Mechanisms', Khanna Publications
      3} Bansal R.K. 'Theory of Machines' ,Laxmi Publications Pvt. Ltd,New Delhi.
Reference Books:-
      1} Ramamurthy, V' Mechanisms of Machines', Narosa Publishing House.
      2} UickerJr, J.J.,Penock G.R. and Shigley, J.E. 'Theory of Machines and Mechanisms.' Tata McGraw Hill.
      3} Bevan Thomas 'The Theory of Machines', CBS publishers and distributors.

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S. E. (Mechanical) Part-II
M-208 - Manufacturing Technology – I

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Teaching Scheme	**Examination Scheme**
Theory: 4 Hrs/Week	MSE: 20 Marks
Practical: 2 Hrs/Week	ESE: 80 Marks
	CE : 30 Marks
	Practical Exam: 70 Marks

Objectives:-
- *To understand the primary manufacturing process classification and use in mechanical engineering.*
- *To acquire the knowledge of casting, metal forming and metal joining processes from the point of view of tools and equipments required, materials processed ,process parameters*
- *To get the practical exposure of utilization of manufacturing techniques for product making through practical and industry visit*

Outcome:
- *Ability to classify and apply the knowledge gained for applicability of processes for different product manufacturing.*
- *To compare and select best suitable manufacturing process based on requirements, advantages, limitations and applications*

UNIT I: **(7)**

1.1 Casting -Introduction; History of the technology; Definition and major classification; Casting materials, Sand mould casting:- Basic principles with simple examples of a solid casting and a hollow casting. Patterns; types, material and design including pattern allowances; (2)

1.2 Moulding sands; composition, preparation, properties and testing; Core; Purpose, definition, materials, preparation and applications; Design of gating system; pouring basin, sprue, runner and risers; Advantages, limitations and applications of top gate, bottom gate, parting gate and step gate; (3)

1.3 Foundry equipment and furnaces. Melting, pouring and solidification. (2)

UNIT II: **(7)**

2.2 Principles, method, relative advantages and applications of floor mould casting, shell mould casting, pit mould and loam mould casting CO_2 mould casting; centrifugal casting (pure, semi and centrifuging types) investment casting ; Permanent mould casting. Die casting; types, methods, relative advantages and applications, Slush casting; principle and use, (5)

2.3 Casting defects; types, causes and remedy (2)

UNIT III: **(7)**

3.1 Forming Processes - Introduction; General principles; major classification with typical examples ;Hot working and cold working; principle, purpose, relative advantages and applications. (1)

3.2 Forging:-Definition and classification giving few example of application; work materials different forging operations, tools and equipment ; Smithy, drop forging and press forging (pressing) methods and use; Forging dies ;types, materials and design. (3)

3.3 Rolling:-Introduction ; basic principles and general applications; Characteristics and applications of hot rolling and cold rolling; various rolling processes and applications and rolled products; Roll pass design for different products (3)

UNIT IV: **(7)**

4.1 Wire drawing and Extrusion:- Basic principles and requirements; Classification, methods and applications; Work materials and products; (2)

4.2 Press tool works; Basic principles, system, operations and applications.
Shearing; Parting, notching, blanking and piercing. Cupping (drawing) and deep drawing. Design of blanks for any shearing and cupping operation. Coining and embossing; basic principle and methods. (3)

4.3 Other forming processes:- Principles, methods, essential requirements and applications of Spinning and flow turning; Bulging; Hydro forming; Magneto forming; Explosive forming.(2)

UNIT V: **(7)**

5.1 Welding- Introduction: Major classes of joining; Mechanical joining; temporary, semi-permanent and permanent Giving examples; Welding; Brazing and soldering; Adhesive bonding;(2)

5.2 Welding in Liquid state. Fusion welding: - Introduction; basic principle, definition and major classification; characteristics and applications of different fusion welding processes using different heat-sources. Heat source:-chemical; gas welding; thermit welding; Heat source:-electrical; Arc welding; Manual arc welding; Submerged arc welding; TIG and MIG; Induction welding; Plasma arc welding; Resistance welding; Spot welding; Butt welding; Seam welding; Projection welding. Laser beam welding and electron beam welding. (5)

UNIT VI: **(5)**
6.1 Solid state welding: - Principles. Methods, requirements and application of the different types; Solid state welding in hot condition; Forge welding; Friction welding; Diffusion welding; Solid state welding in cold condition; Ultrasonic welding. Pressure welding . Explosive welding. (3)
6.2 Welding defects; Types, causes, effects and remedy (2)

Text Books:
1. Rao.P.N. 2001. Manufacturing technology: foundry, forming and welding: McGraw-Hill.
2. Hajra Choudhary – "Elements of Workshop Technology- Vol. I Manufacturing Processes"
Reference Books/Web Source:
1. Ghosh, A., & Mallik, A. K. 1986. Manufacturing science: Ellis Horwood.
2. Kalpakjian, S., & Schmid, S. R. 2008. Manufacturing processes for engineering materials: Pearson Education.
3. Campbell, J. S. Principles of manufacturing materials and processes: Tata McGraw-Hill
4. NPTEL courses, http://www.nptel.iitm.ac.in/courses.php?disciplineId=112 web and video resources on
Manufacturing Processes I.
Term work:
The term work should consists of Practical Jobs Mentioned in (A) and a journal
consisting of contents in (B)
(A) Jobs
1. Pattern making
2. Mould and Core Making
3. Arc Welding
4. Gas Welding
(B)
1. Study of Sand Testing Equipments
2. Study of Cupola and other Furnaces
3. Study of Casting Defects
4. Study of Metal working processes: Hot, Cold and Sheet metal
5. Study of Welding Processes: Fusion, Pressure and Solid state
(Two processes in each Category)
(While writing study assignments it is desirable to visit laboratory/workshop/industrial set up
in addition to referring the text and reference books.)
Practical Exam:
Any one job of 4 hours duration.

S. E. (Mechanical) Part -II
M-209 – Fluid Mechanics & Hydraulics Machines

Teaching Scheme
Theory: 4 Hrs/Week
Practical: 2 Hrs/Week

Examination Scheme
MSE: 20 Marks
ESE: 80 Marks
CE :   30 Marks
Practical Exam: 70 Marks

COURSE OBJECTIVES :
1.   To understand the properties of fluids and their variations with respect to temperature and pressure.
2.   To understand the principles of fluid mechanics governing the behaviour of fluids at rest and in motion.
3.   To understand the working principles of hydraulic turbines and pumps.
4   .To understand the physics of fluid flow and its applications.
5.   To know the losses in flowing fluids in pipes.

COURSE OUTCOMES :
        At the end of this course, the student will have
1.   An ability to identify, formulate and solve problems related to fluids at rest and in motion.
2.   Knowledge to design pipeline systems, floating bodies and hydraulic gates.
3.   Knowledge to design hydraulic turbines and pumps.

UNIT – I   [04 Hrs]

FUNDAMENTALS OF FLUID MECHANICS: Properties of fluids, viscosity, Units of Viscosity, Ideal & real fluids, compressible and incompressible fluids, compressibility and Elasticity, Surface Tension and capillarity.

UNIT - II   [08 Hrs]

FLUID STATICS: Study of variation of pressure with respect to head, forces acting on immersed plane surfaces, centre of pressure and resultant force. Buoyancy force and centre of Buoyancy, metacentric height and equilibrium conditions of floating bodies.
KINEMATICS OF FLUIDS: Visualization of flow patterns, Types of flow, Streamline and path line, acceleration components, stream function and velocity potential function.

UNIT - III   [08 Hrs]

FLUID DYNAMICS: Euler's equation of motion, Bernoulli's equation, application of Bernoulli's equation for orifice meter, Venturimeter and pitot tube. Vortex motion,Laminar and Turbulent flows concept of hydrodynamic boundary layer.

FLOW THROUGH PIPES: Friction factor and Losses in pipes.

DIMENSIONAL ANALYSIS: Dimensions of physical quantities in fluid mechanics, dimensionally homogeneous equations, Buckingham's Π theorem and its use in finding dimensional parameters, Model analysis and testing.

UNIT – IV   [06 Hrs]

IMPACT OF JETS: Introduction, force exerted by fluid jet on stationary flat plate, normal to the Jet and inclined to the Jet, force exerted by fluid Jet on moving flat plate, force exerted by a fluid Jet on moving curved vane. Torque exerted on a wheel with radial curved vanes. Jet propulsion of ships.

UNIT - V   [08 Hrs]

HYDRAULIC TURBINES: Classification of water turbines, the Pelton wheel, velocity triangles, Turbine efficiencies, working proportions of Pelton wheel, Francis and Kaplan turbines. Velocity triangles and efficiencies, the draft tube for turbine, principle of similarity applied to turbines, governing of turbines, cavitation in turbines.

UNIT - VI   [06 Hrs]

PUMPS: Centrifugal pumps- construction and working. Classification, energy increase in fluids due to pump action. Fundamental principle, increasing pumping action, variation of head with discharge, energy losses in a pump, efficiency, principle of similarity and specific speed, characteristic of pumps, net positive suction head (NPSH), cavitation in pumps, self priming pumps, multistage pumps, propeller or axial flow pumps.

TEXT BOOKS:

1.FLUID MECHANICS AND HYDRAULIC MACHINES – Dr. R. K. BANSAL
2.HYDRAULITIES & FLUID MACHINES – Dr. P. N. MODI & SETH REFERENCE BOOKS:
1.FLUID MECHANICS AND HYDRAULIC MACHINES – K. R. ARORA
2.FLUID MECHANICS AND HYDRAULIC MACHINES – Dr. D. S. KUMAR
3.FLUID MECHANICS AND HYDRAULIC MACHINES – R. K. RAJPUT
4.FLUID FLOW MACHINES – N. S. GOVINDA RAO
5.TURBOMACHINES – SHAMES
6.CENTRIFUGAL AND AXIAL FLOW PUMP – STEP ANOFF
7.HUDRAULIC MACHINES – JAGDISH LAL
8.HUDRAULIC MACHINES – V. P. VASAMDANI

TERM WORK:

The term work shall consist of a journal based on laboratory work, which will consist of at least 08 experiments out of the following:

(Minimum four from fluid mechanics and four from Hydraulic Machines)

FLUID MECHANICS:

1. Reynolds apparatus.

2. Verification of Bernoulli's theorem – apparatus.

3. Orifice meter experiment.

4. Venturimeter experiment.

5. Flow through notches experiment.

6. Determination of metacentric height.

7. Major & Minor losses on pipe.

8. Orifice, mouth piece.

HYDRAULIC MACHINES:

1. Pelton wheel.

2. Francis turbine.

3. Kaplan turbine.

4. Centrifugal pump.

5. Gear pump.

6. Torque converter.

7. Cavitation test.

8. Reciprocating pump.

PRACTICAL EXAMINATION:

It shall consist of oral and practical based on the syllabus prescribed above.

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S. E. (Mechanical) Part -II
M-210 - Machine Drawing and CAD

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Teaching Scheme	**Examination Scheme**
Theory: 4 Hrs/Week	MSE: 20 Marks
Practical: 4Hrs/Week	ESE: 80 Marks
	CE : 30 Marks
	Practical Exam: 70 Marks

Course Objectives:

1.   To visualize an object & convert it into a drawing.
2.   To gain knowledge of conventional representation of various machining & mechanical details.

3. To become conversant with 2-D & 3-D drafting.
4. To impart solid modeling ability in to students.
5. To interpret & apply technique for making assembly from the detail/.components.

Course Outcomes:

At the end of this course, the student will be:

1. Able to create drawings as per BIS standards.
2. Visualize & prepare detail drawing of a given object.
3. Read & interpret a given drawing.
4. Able to create assembly models of simple machine.

Unit -1 [06 Hrs]
SECTIONS OF SOLIDS: Projection of solids in simple positions or having their axes inclined to one of the reference planes and cut by a section plane inclined to one of the reference planes, true shape of section.

Unit-2 [06 Hrs]
DEVELOPMENT OF SURFACES: The development of lateral surface of solids or cut solids and composite parts.

Unit-3 [08 Hrs]
INTERSECTION OF SOLIDS: Line of intersection, intersection of Prism and Prism, Cylinder and Cylinder, Cylinder and Prism, Cone and Cylinder, Cone and Prism, Cone and Cone, Application of intersection of surfaces.

Unit-4 [06 Hrs]
4.1 CONVENTIONS: Conventional representations of standard machine parts along with their actual drawing:Conventional representation for surface finish, welded Joints; conventional representation of spur, helical, bevel and worm and worm wheel.

4.2 MACHINE PARTS:

a) Screwed fastening: Thread profiles, locking arrangement of nuts, Foundation bolts.

b) Pipe Joints Flanged, socket and spigot joints, hydraulic, Union joints, expansion jointsand stuffing box.

c) Riveted Joints: Single and Double Riveted Butt and Lap Joints.

d) Keys, Cotter Joints, Pin Joints; Type of Keys, Cotter and Cotter Joints; Pin orKnuckle Joint.

e) Couplings and Shaft joints: Solid Muff coupling, split muff coupling, flanged coupling, protected type flanged coupling, flexible coupling, Universal coupling, Oldham coupling.

Unit -5 [10 Hrs]
ASSEMBLY AND DETAIL DRAWING: Assembly and Detail drawing with Complete Dimensioning, Tolerance, Materials and Surface finish Specification as per SP 46-1988.(To be dealt partially in practical)

Unit – 6 [04 Hrs]
INTRODUCTION TO SOLID MODELLING: (To be dealt partially in practical)

Types of modeling, Limitation of 2D modeling, Limitation of wire frame modeling, Need of Solidmodeling, Benefits of Solid modeling

Representation of Schemes of Solid modeling: CSG or C-rep, B- rep, Sweep,Parametric Modeling, Feature based Modeling

Recommanded Books:

1. N.D. Bhat, V.M. Panchal :-Elementry Engineering Drawing
2. N.D. Bhat, V.M. Panchal :- Machine Drawing
3. Siddheswar, Sastri, Kanaiyah :- Machine Drawing
4. VenuGopal, Narayana :- Production Drawing
5. CAD CAM –Groover and Zimmer
6. Mastering CAD CAM- Ibrahim Zeid
7. Help manuals and tutorials of referred software

ASSIGNMENT ON DRAWING:

1. One sheet on Sections of solids (Minimum 4 problems)
2. One sheet on Development of surfaces. (Minimum 4 problems)
3. One sheet on Intersection of solids (Minimum 4 problems)
4. One sheet on Assembly Drawing
5. One sheet on Detail Drawing

Assembly and detail drawings can be given from the following

a) Tool head of a shaping machine
b) Tail stock of Lathe
c) Vices
d) Boiler Valves
e) Engine Parts

6. A sketchbook consisting of the drawings/sketches of the conventions and machine parts as mentioned in Unit-4 in theory syllabus.

ASSIGNMENT ON CAD:

1. Assignment on 2-D sketching with geometrical and dimensional constraints using any commercially used solid modeling software like AutoCAD/ UniGraphics/ Catia/ ProE, etc
2. Assignment on parametric solid modeling of a machine component using various commands and features of the software.
3. Assignment on solid modeling of the parts of a machine (min. 5 components)
4. Assignment on assembly modeling of the parts modeled in assignment 3 using proper mating conditions.

*Important Notes***:-**

1. Submission of all above assignments on CAD should be in electronic format only (preferably in single
CD/DVD for all batches/students) and should be reviewed by external examiner at the time ofPractical Examination
2. Practical examination for this subject shall consist of creation of part models and assembly ofa machine with minimum *Five* *components.*

S. E. (Mechanical) Part -II
M-211 - PROFESSIONAL COMMUNICATION SKILLS

Teaching Scheme	Examination Scheme
Theory: 2 Hrs/Week	MSE: 10 Marks
Practical: 2 Hrs/Week	ESE: 40 Marks
	CE : 20 Marks
	Practical Exam: 30 Marks

Course Objectives:

1. To understand the concept, process and importance of Professional Communication
2. To enable students to acquire English Speaking and Writing Skills
3. To enable students to develop Presentation Skills

Outcomes:

1. Students would understand the concept, process and importance of Professional Communication
2. Students would acquire English Speaking and Writing Skills
3. Students would develop Presentation Skills

Course Contents:
Unit I Fundamentals of Professional Communication   (05 Hrs)

- Definition of Communication Elements of Communication (Sender, Receiver & Media)
- Communication Process/ Cycle
- Types of Communication (Verbal- Oral & Written, Non-verbal- Body Language, Sign Language & Paralanguage)
- Patterns of Communication in Organization (Internal, External, Upward, Downward, Horizontal, Diagonal, Grapevine)
- Barriers of Communication (Physical, Mechanical, Language, Psychological, Linguistic, Cultural)
- 7 C's of effective Communication

Unit II Speaking Skills   (04 Hrs)

Presentation Skills
- Public Speaking
- Group Discussion
- Interview Skills

Unit III Writing Skills (05Hrs)

Business Correspondence

- Elements/ Parts of Business Letters
- Formats: Full Block, Semi Block
- Job Application, Demand Letter, Letter of Complaint, & Letter of Claim
- Resume Preparation
- Comprehension
- E-mail: Nature, Purpose, Advantages, Characteristics of Successful E-mail messages & E-mail format
- Reports: Meaning, Significance, Essential Features of a good Report & Types of Report

Unit IV Phonetics (05 Hrs)

- Study of Speech Organs
- List of Phonetic Alphabets
- Manner of Articulation of 44 Sounds
- Word Transcription

Unit V Introduction to behavioural Skills (04Hrs)

- Developing Positive Attitude
- Time Management
- Stress Management

Unit VI Vocabulary (02 Hrs)

- Synonyms
- Antonyms
- One word substitution

Term Work/Practical/ Assignments

- Communication Cycle/Process
- Self Introduction
- Extempore
- Role Play
- Listening Phonetic Sounds' Manner of Articulation in Language Laboratory
- Group Discussion
- Mock Interview
- Application Writing

- Email Writing
- Resume Writing
- Vocabulary Based Activity
- PPT Presentation on Non-Technical Issue

Note:
- Use of Language Laboratory is mandatory
- Conduct any eight practical out of twelve
- Practical Examination is obligatory

Text Books:
1. Business Communication by Sangeeta Magan, Biztantra, New Delhi.ISBN: 8177228285
2. Soft Skills for Managers by Dr. T. Kalyana Chakravarthi & Dr. T. Latha Chakravarthi, Biztantra, New Delhi. ISBN 10: 8177225685
3. English Grammar and Composition by Rajendra Pal and Prem Lata Suri, Sultan Chanda and Sons Publisher. ISBN: 978-81-8054-868-0

Reference Books:

1. Behavioural Science by Dr. Abha Singh, Wiley India Pvt. Ltd. ISBN: 9788126538027
2. Soft Skills for Everyone by Jeff Butterfield, Cengage. ISBN: 9788131514672
3. Essentials of Business Communication - Rajendra Pal and J. S. Korlhalli
   Sultan Chand & Sons, New Delhi. ISBN: 8180547299
4. Essential Communication Skills by Shalini Aggarwal, Ane Books Pvt. Ltd,
   New Delhi. ISBN: 978-8180522802
5. Spoken English: A Manual of Speech and Phonetics by R.K. Bansal & J.B. Harrison, Orient Blackswan Pvt. Ltd, Hyderabad. ISBN: 978- 8125050858
6. Ace of Soft Skills by Gopalswami Ramesh, Mahadevan Ramesh, Pearson
   Publication, Delhi. ISBN: 9788131732854
7. Effective Technical Communication by M. Ashraf Rizvi, McGraw Hill Education Pvt.
   Ltd. Delhi. ISBN: 978-00-7059-952-9.