



BansilalRamnath Agarwal Charitable Trust's

Vishwakarma Institute of Technology

(An Autonomous Institute affiliated to SavitribaiPhule Pune University formerly University of Pune)

Structure & Syllabus of

B.Tech. (Mechanical Engineering)

Pattern 'B-14'

Effective from Academic Year 2016-17

(S.Y. B.Tech.)

Prepared by: - Board of Studies in Mechanical Engineering

Approved by: - Academic Board, Vishwakarma Institute of Technology, Pune

Signed by

Chairman – BOS

Chairman – Academic Board

Vision, Mission and PEOs of B. Tech. Mechanical Engineering

Vision of the Department

To be recognized as one of the preeminent Mechanical Engineering Programs

Mission of the Department

- To prepare students competent to make their careers in Mechanical Engineering
- To provide value education to students to make them responsible citizen
- To strengthen collaborations with Industries, Academia and Research Organizations to enrich learning environment and to enhance Research Culture
- To be recognized as a leading Mechanical Engineering Department in the field of Knowledge, Skill and Research

Program Educational Objectives

To achieve the mission of the program, Mechanical Engineering graduates will be able:

- To work independently as well as in team to formulate, design, execute solutions for engineering problems and also analyze, synthesize technical data for application to product, process, system design & development
- To understand & contribute towards social, environmental issues, following professional ethics and codes of conduct and embrace lifelong learning for continuous improvement
- To develop expertise towards use of modern engineering tools, instruments, programming languages and software's
- To acquire and develop careers in industries, Research organizations, academia and demonstrate entrepreneurial skill

Program Outcomes

Mechanical Engineering

Engineering Graduates will be able to:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

Program Specific Outcomes (PSO)

Mechanical Engineering

Mechanical Engineering Graduates will be able to:

1. Read & generate 2D & 3D computer based drawings of Mechanical Engineering components & systems and select appropriate materials and manufacturing processes for their production.
2. Conceptually understand Mechanical Engineering components & systems and thereby design & analyze them for enhancement of thermal & mechanical performance.
3. Conduct experiments on mechanical systems to measure different parameters required to evaluate the performance of materials, components & systems and deduce relevant conclusions

S.Y. B.Tech - Mechanical Engineering Structure with effect from Academic Year 2016-17 MODULE 3

Code	Subject	Type	Teaching Scheme			Assessment Scheme						Credits
			L	P	Tut.	ISA					ESA	
						Test 1	Test 2	HA	Tut.	CA	ESE	
ME 20103	Kinematics and Mechanisms	Theory - Core	3	-	1	10	20	5	5	-	60	4
ME 21121	Differential Equations And Vector Analysis	Theory – Core / MD	3	-	1	10	20	5	5	-	60	4
ME20113	Material Science	Theory – Core	3	-	-	15	20	5	-	-	60	3
ME 20111	Thermal Engineering	Theory – Core	3	-	-	15	20	5	-	-	60	3
ME20119	Industrial Engineering	Theory – MD	2	-	-	15	20	5	-	-	60	2
ME 20311	Thermal Engineering	Lab – Core	-	2	-	-	-	-	-	70	30	1
ME20315	Mechanical Engineering Lab	Lab – Core / MD	-	2	-	-	-	-	-	70	30	1
ME 24304	Geometric Modeling	Lab – SD	-	2	-	-	-	-	-	70	30	1
ME 27401	Mini Project	Project	-	4	-	-	-	-	-	70	30	2
ME20405	Comprehensive Viva Voce	Oral	-	-	-	-	-	-	-	-	100	2
TOTAL			14	10	2							23

S.Y. B.Tech -Mechanical Engineering Structure with effect from Academic Year 2016-17 MODULE 4

Code	Subject	Type	Teaching Scheme			Assessment Scheme						Credits
			L	P	Tut.	ISA					ESA	
						Test 1	Test 2	HA	Tut.	CA	ESE	
ME20114	Manufacturing Processes	Theory - Core	3	-	1	10	20	5	5	-	60	4
ME 20102	Strength of Machine Elements	Theory – Core / MD	3	-	1	10	20	5	5	-	60	4
ME21116	Electronics Engineering	Theory – Core	3	-	-	15	20	5	-	-	60	3
ME 20108	Fluid Mechanics	Theory – Core	3	-	-	15	20	5	-	-	60	3
ME21122	Electrical Machines and Switchgear	Theory – MD	2	-	-	15	20	5	-	-	60	2
ME 20308	Fluid Mechanics	Lab – Core	-	2	-	-	-	-	-	70	30	1
ME21320	Electrical & Electronics Engineering	Lab – Core / MD	-	2	-	-	-	-	-	70	30	1
ME24301	Workshop Practice	Lab – SD	-	2	-	-	-	-	-	70	30	1
ME 27402	Mini Project	Project	-	4	-	-	-	-	-	70	30	2
ME20406	Comprehensive Viva Voce	Oral	-	-	-	-	-	-	-	-	100	2
TOTAL			14	10	2							23

S.Y. B.Tech -Mechanical Engineering Structure with effect from Academic Year 2016-17**Semester I – Irrespective of Module**

Code	Subject	Type	Teaching Scheme			Assessment Scheme						Credits
			L	P	Tut.	ISA				ESA		
						Test 1	Test 2	HA	Tut.	CA	ESE	
ME20317	Machine Drawing I	Lab – Core	-	2	-	-	-	-		70	30	1
HS20108	Lab	Technical Writing	-	2	-	-	-	-		70	30	1
TOTAL			-	4	-							2

S.Y. B.Tech -Mechanical Engineering Structure with effect from Academic Year 2016-17**Semester II – Irrespective of Module**

Code	Subject	Type	Teaching Scheme			Assessment Scheme						Credits
			L	P	Tut.	ISA				ESA		
						Test 1	Test 2	HA	Tut.	CA	ESE	
ME20318	Machine Drawing II	Lab – Core	-	2	-	-	-	-		70	30	1
HS20307	Lab	General Seminar-II	-	2	-	-	-	-		70	30	1
TOTAL			-	4	-							2

MODULE -IV

ME20108:FLUID MECHANICS		Unit 1:
Credits: 03	Teaching Scheme: - Theory 3 Hr/Week	

Viscosity and Mass Conservation**(8 Hours)**

Part A: Types of Fluids, Newton's Law of viscosity, Surface Tension, Capillarity, Mass conservation equations, streamlines

Part B: Types of Flows, Potential function, Vapour pressure

Unit 2: Momentum Equation**(8 Hours)**

Part A: Momentum equation and its applications, local and convective acceleration, Euler equation

Part B: Moving Jet Problems

Unit 3: Bernoulli's equation**(8 Hours)**

Part A: Bernoulli's equation-derivation and applications, Venturimeter, Orifice meter and Pitot tube, limitations of Bernoulli's equation

Part B: Triangular and rectangular Notches

Unit 4: Dimensional analysis and Laminar Flows**(8 Hours)**

Part A: Buckingham Pi Theorem, Non-dimensional parameters and applications, Laminar flow in channel and pipes, Potential flows

Part B: Model testing

Unit 5: Internal and External Flows**(8 Hours)**

Part A: Friction Factor, Pipe losses, Boundary layer over external bodies, Flow separation and control methods, Lift generation, flow simulation methodology

Part B: Siphon, Transmission of Power, Drag and Lift Characteristics of bodies

Text Books:

- 1) R. K. Bansal, Fluid Mechanics, 9th Edition Laxmi Publication (P) Ltd., New Delhi
- 2) R. K. Rajput, Fluid Mechanics and Hydraulic Machines, 4th Edition, S. Chand & Company Ltd.
- 3) Somand Biswas, Fluid Mechanics and Fluid Machines, 2nd Edition, Tata McGraw Hill

Reference Books:

- 1) Frank M White, Fluid Mechanics, 6th Ed., Tata McGraw Hill New Delhi
- 2) Yunus A. Çengel, Fluid Mechanics, 2010 Edition, Tata McGraw-Hill Education

Course Outcomes:

Structure and syllabus of S.Y. B.Tech. Mechanical Engineering. Pattern B-14, A.Y. 2016-17

The student will be able to –

- 1) Develop an intuitive understanding of basic principles of Fluid Mechanics
- 2) Apply essential Momentum equation of Fluid Mechanics to engineering problems like moving jet etc.
- 3) Understand the Bernoulli's principle and its applications.
- 4) Understand and apply dimensional analysis for fluid mechanics problems.
- 5) Calculate various energy losses in pipe flow.
- 6) Understand the idea of Boundary Layer theory and its effects.

ME20308:FLUID MECHANICS LAB	
Credits: 01	Teaching Scheme: - Practical 2 Hr/Week

List of Practicals:

1. Study of variation in viscosity with temperature of an oil
2. Study of different pressure measuring devices
3. Flow Net by Electrical Analogy method
4. Verification of Bernoulli's Theorem
5. Calibration of Venturimeter
6. Measurement Of Major And Minor Losses
7. Flow through pipes
8. Reynold's Experiment
9. Calibration of Notch
10. Haleshaw's Apparatus
11. Verification of impulse momentum equation
12. Impact of Jet

Text Books:

- 1) R. K. Bansal, Fluid Mechanics, 9th Edition, Laxmi Publication (P) Ltd., New Delhi
- 2) R. K. Rajput, Fluid Mechanics and Hydraulic Machines, 4th Edition, S. Chand & Company Ltd.
- 3) Somand Biswas, Fluid Mechanics and Fluid Machines, 2nd Edition, Tata McGraw Hill

Reference Books:

- 1) Frank M White, Fluid Mechanics, 6th Ed., Tata McGraw Hill New Delhi
- 2) Yunus A. Çengel, Fluid Mechanics, 2010 Edition, Tata McGraw-Hill Education
- 3) D. S. Kumar, Fluid Mechanics And Fluid Power Engineering, 4th Edition, S. K. Kataria & Sons

Course Outcome:

1. Students will demonstrate the ability to design and conduct experiments, interpret and analyze data and report results
2. Student will develop ability to validate basic fluid mechanics principles.
3. Student will get the hands on experience on various flow measuring instruments

ME20102 :: STRENGTH OF MACHINE ELEMENTS	
Credits: 03	Teaching Scheme: - Theory 3 Hrs/Week

Unit 1: Simple Stress And Strain**(8 Hours)**

Part A: Simple Stress And Strain

Concept of stress and strain, types of stresses and strains, Thermal stresses and strains, Hooke's law, Poisson's ratio, Moduli of elasticity, stress strain diagram for ductile and brittle material; material strengths, proof stress, Factor of safety, analysis of axially loaded members.

Part B: Elastic constants and factor of safety

Relationship between elastic constants, state of stress at a point. Statically indeterminate problems.

Unit 2: Shear force, bending moment and bending stresses**(9 Hours)**

Part A: Shear force and bending moment

Shear forces & bending moments of determinate beams due to concentrated loads, uniformly distributed loads, uniformly varying loads & couples, relation between SF & BM diagrams for cantilevers, simply supported and compound beams. Maximum bending movement & positions of points of contra flexure.

Bending Stresses

Theory of Simple Bending, Flexure formula, Area center and moment of inertia of common cross sections (rectangular section, T section, Channel section, I section) with respect to centroidal and parallel axis, bending stress distribution, moment of resistance and section modulus.

Part B:

Introduction to unsymmetrical bending

Unit 3: shear stresses in beams, torsional stresses and combined stresses (8 Hours)

Part A: Shear Stresses

Shear stress distribution, shear stress distribution diagram for common cross sections, Maximum and average shear stresses.

Shear connection between flange and web.

Torsion in Circular Shafts

Stresses, strains and deformations in solid and hollow shafts, derivation of torsion equation, Statically indeterminate shaft.

Part B: Combined stresses

Stresses due to combined torsion, bending and axial force on shafts, Stresses in curved beams (for circular cross-section only).

Unit 4: Principal Stresses and Strains

(7 Hours)

Part A: Principal Stresses and Strains

Stresses on oblique plane, Principle planes and planes of maximum shear, Principle stresses and maximum shear stresses, Mohr's circle for two dimensional state of stress, maximum absolute shear stress.

Part B: General state of stress, Principle Strains

Unit 5:

(8 Hours)

Part A: Slope and Deflections of Beams

Relation between bending moment and slope, slope and deflection of determinate beams, Double integration method (Macaulay method). Derivation of formulae for slopes and deflections for standard cases.

Axially Loaded Columns

Concept of buckling of columns, Derivation of Euler's formula for buckling load for column with hinged ends. Concept of equivalent length for various end conditions. Limitations of Euler's formula. Rankine buckling load.

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, strain energy due to self load.

Part B: Moment area method for slope and deflection of beams, Castigliano's theorem

Text Books:

1. Gere and Timoshenko; Mechanics of Material; 4th Edition, CBS Publishers
2. S. Ramamrutham; Strength of Materials; 15th Edition, Dhanpat Rai Publishing Company
3. Singer and Pytel; Strength of Materials; 4th edition, Harper and Row Publications
4. Beer P. Johnson, E. Russell Johnston Jr., John T. Dewolf, David F. Mazurek; Mechanics of Material ; 2th edition, Mc Graw Hill publications

Reference Books:

1. E. P. Popov; Introduction to Mechanics of Solids; 2nd edition, Prentice Hall Publishers.

2. Junnarkar and Advi; Mechanics of Structures Vol I; , 19th edition, Charotar Book Co
3. Shigley J. E. and Mischke C. R.; Mechanical Engineering Design; 6th edition, McGraw Hill Inc.

Course Outcomes:

1. Students will be able to evaluate stresses under various loading conditions.
2. Students will be able to draw shear force and bending moment diagrams under various loading conditions.
3. Students will be able to evaluate principle stresses for plane stress problems.
4. Students will be able to analyze long and short columns subjected to axial loads.
5. Students will be able to determine slope and deflection for the given beam.

ME 20202:: STRENGTH OF MACHINE ELEMENTS (Tutorial)	
Credits: 01	Teaching Scheme: - Practical 1Hr/Week

List of Tutorials:

1. Assignment on selection of Factor of safety.
2. Assignment on Relationship between elastic constants.
3. Assignment on calculation of bending and shear stress.
4. Assignment on Shear connection between flange and web, shear flow.
5. Assignment on computation of principle stress.
6. Assignment on torsional and combined stresses.
7. Assignment on properties of Engineering Materials.
8. Assignment on Buckling of columns.
9. Assignment on strain energy, impact loading, Castigliano's theorem.
10. Correlating theoretical stress calculation to the strain gauge output.

Text Books:

1. Gere and Timoshenko; Mechanics of Material; 4th Edition, CBS Publishers
2. S. Ramamrutham; Strength of Materials; 15th Edition, Dhanpat Rai Publishing Company
3. Singer and Pytel; Strength of Materials; 4th edition, Harper and Row Publications
4. Beer P. Johnson, E. Russell Johnston Jr., John T. Dewolf, David F. Mazurek; Mechanics of Material ; 2th edition, Mc Graw Hill publications

Reference Books:

1. E. P. Popov; Introduction to Mechanics of Solids; 2nd edition, Prentice Hall Publishers.
2. Junnarkar and Advani; Mechanics of Structures Vol I; , 19th edition, Charotar Book Co
3. Shigley J. E. and Mischke C. R.; Mechanical Engineering Design; 6th edition, McGraw Hill Inc.

Course Outcomes:

1. Students will be able to evaluate stresses under various loading conditions.
2. Students will be able to draw shear force and bending moment diagrams under various loading conditions.
3. Students will be able to evaluate principle stresses for plane stress problems.
4. Students will be able to analyze long and short columns subjected to axial loads.
5. Students will be able to determine slope and deflection for the given beam.

ME20114 :: MANUFACTURING PROCESSES	
Credit: 03	Teaching Scheme: - Theory 3 Hrs/Week

Unit 1: Metal Casting Processes**(8 Hours)****Part A:**

Introduction to Casting, Pattern, Pattern allowances, Pattern Materials, Types of Patterns, Sand molding procedure, Cores, core prints, Mechanization of moulding procedure, Jolt m/c, Squeeze m/c, Design of Gating System, Shell moulding, Investment Casting, Die casting, Centrifugal casting, Continuous casting., properties and testing. Cleaning and finishing. Defects in casting.

Part B: (Self-study)

Melting and pouring, melting furnaces, Cupola, fuel fired, electric arc and induction furnaces. Applications of the casting processes and their example components.

Unit 2: Metal Forming**(8 Hours)****Part A:**

Hot working, Cold working processes, Forming processes :Forging, Press forging, Die forging, Hot and Cold Rolling, Types of Rolling Mills, Extrusion- Direct and indirect Drawing- Wire drawing, tube drawing Swaging, shot peening Sheet metal operations: Punching, Blanking, Drawing, Punch and Die Clearance, Types of Dies, Wire Drawing process, Extrusion, Bending operation, Perforating, Notching operations.

Part B:(Self-study)

Hot spinning process, Coining, Embossing, Coining, Embossing, Bending operation, Perforating, Notching

Unit 3: Metal Cutting / Machining Processes**(8 Hours)****Part A:**

Introduction to machining, Conventional and non-conventional machining, Types of machining operations. Lathe, Drilling Machine and milling Machine: Principle, Operations performed Construction and working, Functions of different parts. Calculations of Machining time, Other Machining processes: Planning, Shaping and Boring Machines

Part B:(Self-study)

Identification of Machined components and their machining processes used

Unit 4: Grinding and Joining Processes**(8 Hours)****Part A:**

Abrasive machining process machines – Types, construction and operation. Grinding wheel – Designation, mounting and dressing of grinding wheels. Classification of Welding/ Joining process, Arc Welding- Theory, TIG, MIG,, Submerged arc welding, Stud Welding. Resistance

welding- Theory, Spot, Seam and Projection weld process. Gas Welding. Soldering, brazing and braze welding, Soldering, Adhesive bonding, Use of fasteners, Assembly techniques

Part B:(Self-study)

Applications of these processes with specific examples. Superfinishing processes - honing, lapping, buffing and burnishing.

Unit 5:Manufacturing Processes for Non-Metals

(8 Hours)

Part A:

Manufacturing processes for ceramics, Polymers, and Composites

Part B:(Self-study)

Applications of these processes with specific examples.

Text Books:

HajaraChoudhari, Bose S. K., Elements of Workshop Technology; Vol I, II Asia Publishing House

2. P. N. Rao Manufacturing Technology Vol I & II Tata McGraw Hill Publishing Co

Reference Books:

R. K. Jain Production Technology, Khanna Publishers

2. P. C. Sharma, Production Technology, Khanna Publishers

3. Chapman W. A. J. Workshop Technology Vol I, II, III, ELBS Publishers

4. HMT Production Technology, Tata McGraw Hill Publishing Co

5. Degarmo, Black and Koshert, Materials and Processes in manufacturing 8th Edition Prentice Hall of India

Course Outcomes:

1. Students will be able to write process chart for manufacturing a component on Lathe machine
2. Students will be able to calculate machining time required for machining various components on Lathe, Drilling and milling machines.
3. Students will be able to design Patterns for Sand moulding methods with considerations of allowances.
4. Students will be able to calculate optimum material requirement for any sheet metal products.
5. Students will be able to suggest Manufacturing Processes for various components

ME20214 :: MANUFACTURING PROCESSES (TUTORIAL)	
Credits: 01	Teaching Scheme: - Tutorial 1 Hrs/Week

List of Tutorials:

1. Design & Drawing of sand casting procedure for a component starting from pattern. Problems on Gating system. (CO)
2. Cupola Furnace (Construction ,Working, Charging ,zones & reactions) (CO)
3. Construction & working of Combination Die & Progressive Die (CO)
4. Design of Blanking Die.(CO)
5. Design of Drawing Die. (CO)
6. Problem on Machining operations on Lathe (Machining time calculations, Taper angles, Set over, Change gears) (CO)
7. Problems on Indexing on Milling machines (CO)
8. Process Sheet for component (CO)
9. Design of Welding fixtures (CO)
10. Grinding Wheel specifications (CO)
11. Manufacturing processes for ceramics (CO)
12. Report of an Industrial visit.(CO)

Text Books :

1. HajaraChoudhari, Bose S. K., Elements of Workshop Technology; Vol I, II Asia Publishing House
2. P. N. Rao Manufacturing Technology Vol I & II Tata McGraw Hill Publishing Co

Reference Books :

1. R. K. Jain Production Technology, Khanna Publishers
2. P. C. Sharma, Production Technology, Khanna Publishers
3. Chapman W. A. J. Workshop Technology Vol I, II, III, ELBS Publishers
4. HMT Production Technology, Tata McGraw Hill Publishing Co
5. Degarmo, Black and Koshert, Materials and Processes in manufacturing 8th Edition Prentice Hall of India

Course Outcomes:

1. Students will be able to write process chart for manufacturing a component on Lathe machine
2. Students will be able to calculate machining time required for machining various components on Lathe, Drilling and milling machines.

3. Students will be able to design Patterns for Sand moulding methods with considerations of allowances.
4. Students will be able to calculate optimum material requirement for any sheet metal products.
5. Students will be able to suggest Manufacturing Processes for various components

ME21116:: ELECTRONICS ENGINEERING	
Credits: 03	Teaching Scheme: - Theory 3 Hrs/Week

Unit I (8hrs)

- A. Overview of diodes, Zener diode and application as a voltage regulator, half wave rectifier and full wave rectifier and its analysis with respect to ripple factor, efficiency. Introduction to BJT, BJT characteristics, BJT configurations (CB, CE, CC), thermal runaway, application of transistor as switch and amplifier.
- B. Clipper and clamper circuits.

Unit II (8hrs)

- A. Operational amplifier, block diagram representation of op-amp, schematic symbol, ideal op-amp characteristics and typical parameter values of op-amp (741) .Op-amp circuit as buffer, inverting and non inverting amplifier, adder and subtractor, differential amplifier. Monostable and astablemultivibrator using op-amp.
- B. Op-amp application as Zero crossing detector.

Unit III (8hrs)

- A. Silicon Controlled Rectifier (SCR), SCR Control Circuits, SCR applications: half and full wave controlled rectifiers, Introduction to DIAC, MOSFET, Power MOSFET and IGBT. Power Supplies: Introduction to SMPS, types of SMPS- Buck, Boost, Buck-Boost SMPS, Online UPS, Offline UPS and Line interactive UPS.
- B. TRIAC.

Unit IV (8Hrs)

- A. Number System, different types of number systems, conversion, 1's complement, 2's compliment, Boolean Algebra, Product of sum , sum of products, Logic gates - AND, OR, XOR. Universal Gates – NAND and NOR. Implementation of logic functions using gates, Introduction to K-map.
- B. Implementation of basic gates using universal gates.

Unit V (8hrs)

- A. Code converter, half adder, full adder, parity generator, parity checker, digital comparator, multiplexer, demultiplexer, decoder, encoder, Introduction to latches, flip-flops, and types of flip flops. Introduction to Microprocessor.
- B. Half subtractor, Full subtractor.

Text Books

1. Integrated Electronics ,MillmanHalkias , Tata McGraw Hill1.
2. Op- amp and Integrated Circuits, RamakantGayakwad, PHI
3. M. H. Rashid, “POWER ELECTRONICS circuits devices and applications”, PHI, 3rd edition, 2004.
4. M. Morris Mano, ‘Digital Design’, Pearson Education, 2006.
5. R.P.Jain, ‘Modern Digital Electronics’, Tata Mcgraw Hill,4th Edition

Reference Books

1. Linear Integrated Circuits, D. Roy Choudhary
2. Charles H.Roth, ‘Fundamentals Logic Design’, Jaico Publishing, IV edition, 2002.
3. P. C. Sen, “Modern Power Electronics”, S Chand & Co., New Delhi
4. Floyd, ‘Digital Fundamentals’, 8th edition, Pearson Education, 2003.
5. John F.Wakerly, ‘Digital Design Principles and Practice’, 3rd edition, Pearson Education, 2002.

Course Outcomes:

The student will be able to –

1. Describe basic electronic circuits using diodes and transistors.
2. Analyze basic operational amplifiers circuits.
3. Analyze basic power electronic components and simple power supply circuits.
4. Apply basics of digital electronics to solve problems related to number systems and Boolean algebra.
5. Design basic digital electronic circuits.

ME20317 :: MACHINE DRAWING I	
Credits: 01	Teaching Scheme: - Practical 2 Hrs/Week

List of Practicals – Drawing Sheets / Assignments :

Sheet I

IS conventional representation of Various components as per IS-SP 46 standard.
(Including some Free-Hand Drawings)

Sheet II

Threaded Joints : Introduction , nomenclature , Forms of threads, thread series, Threads Designation, Types, Representation of threads , Bolts, Nuts, Set-Screws, Stud, locking arrangements for Nuts, Foundation bolt

Sheet III

Various types of Production Drawings, Part, Assembly & Details drawings, Schematic , Exploded, pictorial and Patent Drawings / representation. Bill of Materials, Process Sheet preparation. ISO system of tolerancing. Tolerance chart, hole and shaft base system of tolerancing, Limits, Basic types of fits (clearance, transition and interference) .Selection and judgement of type of fit from dimensions and specified tolerance and applications. Blue print reading

Sheet IV

Geometrical Dimensioning & Tolerancing (GD & T) and Surface Roughness .Tolerances for Single Features such as Straightness, Flatness, Circularity, Cylindricity. Tolerances for Related Features such as Parallelism, Perpendicularity, Angularity, Concentricity, Tolerance Symbol and Value, Indicating Geometrical Tolerances on drawings. Surface Finish: Introduction, Surface Roughness Number, Machine symbols, Indication of Surface Roughness, Eg. Piston cylinder assembly, IC engine components, Joint & coupling

Sheet V

Auto LISP :Data types, User input and output, Math operators and functions, Trigonometric functions, logical operator, String function, Data conversion functions, List filtering functions, Decision making and looping

Menu Customization in AutoCAD, Introduction to 3D CAD Modeling.

Sheet VI

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Auto cad drawings of Assembly showing details drawing of machine component like knuckle joint, coupling with BOM. Isometric drawing, Exploded view, Parametric drawing, (Using of standard parts from libraries)

Text Books: (As per IEEE format)

1. K.L.Narayana, P. Kannaiah and K. VenkataRaddy, "Machine Drawing", New Age International Ltd.
2. David I. Cooke and Robert N. McDougal, "Engg. Graphics and design with computer applications", Holt Sounders International edition.
3. Ajit Singh, "Machine Drawing", Tata Mc Graw Hill Publications.

Reference Books: (As per IEEE format)

1. IS Code "Engineering drawing practice for schools and colleges" : SP46 : 1988.
2. "Machine Tool Design handbook", CMTI, Tata McGraw Hill Publication.
3. "Design Data Book", P.S.G. College of Technology, Coimbtore.
4. "Westermann Tables for metal Trade", Wiley Publication

Course Outcomes:

The student will be able to –

- 1 read and draw conventional representation of Various components as per standards
- 2 Develop primary knowledge of working drawing , tolerances and fits
- 3 know and apply dimensioning ,tolerancing on production drawing as per standards
- 4 Read and understand the production drawings of mechanical components and assemblies
- 5 represent any component pictorially and as production drawing in free hand, with drawing instruments and CAD software

ME20318 :: MACHINE DRAWING II	
Credits: 01	Teaching Scheme: - Practical 2 Hrs/Week

List of Practicals – Drawing Sheets / Assignments :

Sheet I

Welded Joints: Introduction, Welded Joints and symbol, Dimensions, designations.

Riveted Joints: Introduction, Classification of rivet heads, Joints.

Sheet II

Piping Symbols, Piping layout views. Process Chart of a simple component with Tolerances and fits.

Sheet III, IV ,V& VI (III & IV from given drawing, V & VI from actual assembly)

Details and Assembly Drawing with Tolerances, fits and BOM.

Part and Assembly Drawing of lathe tail stock, Gate valve, screw jack, safety valve etc. (Any 3 components).

Any one Sheet should be based on Dismantling, Assembly and Measurement of dimensions of a simple mechanical assembly . General study of measuring instruments used for measuring the dimensions, Dismantling and assembly sequence, Qualitative observation of fits between different mating parts, Application and working of the studied assembly, Use BOM

Sheet VII

AutoCAD drawing of Making of piping symbol library and a piping layout in orthographic and isometric form. Eg. Steam flow piping for process industry like sugar,Hydraulic circuit of press,Lubrication layout of machine tool,Electric component diagram of automat

Text Books: (As per IEEE format)

1. K.L.Narayana, P. Kannaiah and K. VenkataRaddy, “Machine Drawing”, New Age International Ltd.
2. David I. Cooke and Robert N. McDougal, “Engg. Graphics and design with computer applications”, Holt Sounders International edition.
3. Ajit Singh, “Machine Drawing”, Tata Mc Graw Hill Publications.

Reference Books: (As per IEEE format)

1. IS Code "Engineering drawing practice for schools and colleges" : SP46 : 1988.
2. “Machine Tool Design handbook”, CMTI, Tata McGraw Hill Publication.
3. “Design Data Book”, P.S.G. College of Technology, Coimbtore.
4. “Westermann Tables for metal Trade”, Wiley Publication

Course Outcomes:

The student will be able to –

1 create, read/interpret and modify drawings of machine components and assemblies, by free-hand, instruments and 2D CAD – both orthographic and isometric

2 measure dimensions of components and make production drawings for the same.

3 understand and apply limits, fits, tolerances and surface finish on the existing and new drawings, as per standards.

4 understand and prepare layout and drawings of rivetted, welded and piping joints .

5 use Autocad for preparing and using symbol libraries for various types of components.

ME27402 :MINI PROJECT	
Credits: 02	Teaching Scheme: - Practical 4 Hr/Week

Guidelines:

1. Mini Project can be an individual or a group activity depending on the depth and scope of the topic.
2. The project work can be any of the form given below :
 - a) Making physical working models, prototypes, scaled models, of a concept machine.
 - b) Making virtual / CAD models of a sufficiently complex machines / concepts.
 - c) Making study, modeling, analysis, programming and simulation of a system / machine / operation / process.
 - d) Making study / teaching modules of a sufficiently complex topic for pedagogy purposes.
3. Group formation, discussion with faculty advisor, formation of the Semester Mini Project statement, resource requirement, if any should be carried out in the earlier part of the Semester.
4. The students are expected to utilize the laboratory resources before or after their contact hours as per the prescribed module.
5. A complete Assembly and Details drawings of the project should be submitted along with a detailed project report, where applicable.
6. A Detailed Background / field / literature survey, related to the topic must be made and presented in the report.
7. Review – I: during Mid Semester Examination (Compulsory) as per the Academic Calendar.
8. Review – II : The last week of the Semester . (Optional)
9. For poor performing students identified by the examiners, a second review to be taken. Review II optional for other students. For Review II, deduction of 10 marks will take place.

Evaluation Scheme :

1. Attendance during Semester – 10 marks
2. Regularity in project work execution and reporting – 10 marks
3. Relevance of Mini-Project topic – 10 marks
4. Timely Abstract submission – 10 marks
5. Literature review – 10 marks
6. Technical contents /skills / Knowledge – 10 marks
7. Presentation – 25 marks
8. Question & answer Session – 15 marks

100 marks

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Duration of presentation – 10 minutes , Question and answer session – 5 minutes

Course Outcomes:

1. Students will be able to apply basic principles and concepts for development of working model
2. Students will be able to work in groups and participate in group discussions
3. Students will be able to demonstrate and present the working model
4. Student will be able to develop skills of technical report writing and presentation

ME20406 :COMPREHENSIVE VIVA VOCE	
Credits: 01	Teaching Scheme: - Nil

The Comprehensive Viva Voce (CVV) will be conducted at end of semester on basis of following Laboratory courses

- Mechanical Engineering Lab
- Thermal Engineering
- Machine Drawing I / II

HS20307 :GENERAL SEMINAR	
Credits: 01	Teaching Scheme: Practical 2 Hr/Week

List of Demonstration and Practical Sessions

Sr. No.	Name of Experiment	Mode of Conduct
1	Introductory Session	Student activities in groups: Each student must present any technical topic for 15 min followed by an evaluation by the teacher for 10 min using evaluation criterion. All other non participating must attend and can give suggestions. Each student will give minimum of two presentations per semester.
2	Presentations by 4 – 5 students (1stTopic)	
3	Presentations by 4 – 5 students (1stTopic)	
4	Presentations by 4 – 5 students (1stTopic)	
5	Presentations by 4 – 5 students (1stTopic)	
6	Presentations by 4 – 5 students (1stTopic)	
7	Presentations by 4 – 5 students (1stTopic)	
8	Presentations by 4 – 5 students (2ndTopic)	
9	Presentations by 4 – 5 students (2ndTopic)	
10	Presentations by 4 – 5 students (2ndTopic)	
11	Presentations by 4 – 5 students (2ndTopic)	
12	Presentations by 4 – 5 students (2ndTopic)	

Text Books

1. “Developing communication skills “ – Krishna Mohan and Meera Banerji , 2008
McMilan Publishers Delhi
1. “Speaking and writing for effective business communication “Francis Sounderaraj 2009 ,
McMilan Publishers India ltd, delhi
3. “Technical writing and professional communication for non native speakers of English
“ – International edition 1991 – Thomas N Huckin & Leslie A Olsen
2nd edition Tata McGrawhill publishing company.
4. Technical communications - A practical approach 2007 “ – William Sanborn
Pfeiffer & TVS Padmaja – 6th edition Dorling Kindersley (India) Pvt ltd , Delhi.

Reference Books

1. “ Cambridge English for engineering “ Mark Ibbotson , Cambridge university press Delhi
2. “ Professional presentations “ Malcolm Goodale , Cambridge university press 2009
3. “ Technical Report Writing Today “ – 8th edition (Indian Adaptation 2004
Daniel G Roirdon , Steven E Penley Biztantra publications New Delhi
4. “ English for success “ E Sureshkumar , P Srihari , J Savitri –
Cambridge University Press India Pvt ltd , 2010 , Delhi

HS20108 : TECHNICAL WRITING	
Credits: 01	Teaching Scheme: Practical 2 Hr/Week

UNIT I (2 + 2 = 4Hrs)

[A] Definition, Structure and types of reports.

[B] Home Assignments related to the above topics.

UNIT II (4+ 2 = 6 Hrs)

[A] Importance of references, glossary and bibliography. How to write and insert them in reports

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[B] Home Assignments related to the above topics.

UNIT III (3 + 2 = 5 Hrs)

[A] Use and types of charts and illustrations in report writing

[B] Home Assignments related to the above topics (minimum 25 sentences on each topic).

UNIT IV (3 + 2 = 5 Hrs)

[A] Various report writing techniques

[B] Home Assignments related to the above topics.

UNIT V (3 + 2 = 5 Hrs)

[A] A detail study of any report (non technical and technical)

[B] Home Assignments related to the above topics.

Text Books

2. “Techniques of writing memos , reports and business letters “ Courtland L Bovee
2005 Jaico Publishing house Mumbai

2.“ Project Report writing “ MK Rampal , SL Gupta 2010 Galgotia Publishing company Delhi

Reference Books

1. “ The effective presentation “ Asha Kaul 2005 Sage Publications Delhi

2. “ Business communication and report writing “ R.C Sharma and KrishnaMohan
2nd edition , 2000 , Tata McGrawhill publishing company

ME24301 :: WORKSHOP PRACTICE	
Credits: 01	Teaching Scheme: - Practical 2 Hrs/Week

List of Practicals:**1. Turning**

Introduction and demonstrations of different lathe operations such as knurling, grooving, drilling, boring, reaming, threading, etc., safety precautions.

Practical: One composite job involving the above mentioned operations.

2. Foundry

Introduction, uses of different foundry tools, sand preparation, mould preparation, metal pouring, safety precautions, etc.

Practical: One job of casting.

3. Demonstrations

CNC machining: Demonstration on a CNC lathe machine

Machine Part Assembly: Demonstration and exercise on assembly of machine parts in a group of students.

Text Books: (As per IEEE format)

1. "Workshop Technology Vol. I, II", H. S. Bawa, Tata McGraw-Hill, New Delhi
2. "Principles of Foundry Technology", P. L. Jain, Tata McGraw-Hill New Delhi, 5th Edition 1995

Reference Books: (As per IEEE format)

1. "Production Technology", HMT, Tata McGraw Hill, New Delhi, 1st Edition 1987
2. "Maintenance Engineering Handbook", Lindley R. Higgins, McGraw-Hill Inc. 1995

Course Outcomes:

The student will be able to –

1. Students will be able to perform different operations on Lathe machine.
2. Students will be able to make a component by sand casting method.
3. Students will see the working of CNC lathe machine.
4. Students will be able to assemble different machine parts.

ME21320 :: Electrical And Electronics Engineering (Lab)	
Credits: 01	Teaching Scheme: - Laboratory 2 Hrs/Week

List of Practicals:

The list of experiments based on the theory course ‘Electrical Engineering’ is given below.

Any 6 experiments from the list below (1, 2 and 5 are compulsory)

1. Speed control of DC shunt motor.
2. Load test on DC shunt motor.
3. Load test on DC series motor.
4. Study of DC motor starters.
5. Load test on three phase induction motor.
6. Study of single phase induction motor.
7. Study of stepper motor.
8. Study of an electrical control panel and interlocking.

Text Books:

1. *Edward Hughes, Electrical Technolog., Longman Scientific & Technical*
2. *B. L. Theraja Vol – 2, Electrical Technology, S Chand Publications*
3. *Guru, Hiziroglu, Electric Machinery & Transformers, Oxford University Press.*

Reference Books:

1. *Fitzgerald, Electric Machinery, Sixth Edition TMH.*
2. *Theodore Wildi, Electrical Machines, Drives & Power systems, Pearson Education.*
3. *Nagrath Kothari, Electric Machines, TMH*

Course Outcomes:

The student will be able to –

1. Do the logical development of switchgear circuits diagram.
2. Performance analysis of different parameters of d.c.machines
3. Performance analysis of different parameters of a.c.machines

The list of experiments based on the theory course ‘Electronics Engineering’ only is given below.

1. Half wave and Full wave Rectifier
2. Clippers and Clampers
3. BJT as Switch and CE Amplifier
4. Study of Logic Gates with truth table verification
5. Implementation of Full Adder using Multiplexer

Text Books

1. Integrated Electronics ,MillmanHalkias , Tata McGraw Hill1.
2. Op- amp and Integrated Circuits, RamakantGayakwad, PHI
3. M. H. Rashid, “Power Electronics circuits devices and applications”, PHI, 3rd edition, 2004.
4. M. Morris Mano, ‘Digital Design’, Pearson Education, 2006.
5. R.P.Jain, ‘Modern Digital Electronics’, Tata McGraw Hill,4th Edition

Reference Books

1. Linear Integrated Circuits, D. Roy Choudhary
 2. Charles H.Roth, ‘Fundamentals Logic Design’, Jaico Publishing, IV edition, 2002.
 3. P. C. Sen, “Modern Power Electronics”, S Chand & Co., New Delhi
 4. Floyd, ‘Digital Fundamentals’, 8th edition, Pearson Education, 2003.
- John F.Wakerly, ‘Digital Design Principles and Practice’, 3rd edition, Pearson Education, 2002.

Course Outcomes:

The student will be able to –

- 1.Implement basic analog and digital electronic circuits using diodes, transistors and logic gates. (Unit-I,IV,V)
- 2.Test fundamental analog and digital electronics circuits. (Unit-I,IV,V)

ME21122 :: Electrical Machines and Switchgear	
Credits: 2	Teaching Scheme: Theory 2 Hrs/Week

Unit 1: LT switchgear and stepper motors: (6Hours)

Part A: Introduction to LT switchgear, NO and NC contacts, contactors, relays, timers, use in control panel, application in interlocking and protection, symbols.

Stepper motors, construction, types, working, characteristics, applications in automation and robotics.

Part B: Study of a simple electrical control panel and stepper motor drive.

Unit 2: DC Machines -1 (5 Hours)

Part A: DC machines - Construction and working principle, commutator, emf equation, types.

Part B: Types of armature windings.

Unit 3: Title of the Unit (5 Hours)

Part A: DC motors - Working principle, role of commutator, back emf, torque equation, types, motor characteristics, speed control methods, numerical problems, selection and applications of DC motors.

Part B: Different starters of DC motors.

Unit 4: AC Motors – 1 (5 Hours)

Part A: Three phase Induction Motors- Construction, RMF, working principle, operation, types, slip and torque equations, max torque, starting torque, full load torque, condition for max torque, torque-slip characteristics.

Part B: Different starters of induction motors.

Unit 5: AC Motors – 2 (5 Hours)

Part A: Numerical problems on torque equation and Power flow in induction motor. Single phase Induction motors: Construction, working principle, operation, torque development, types and applications.

Part B: Servo motors.

Text Books: (As per IEEE format)

4. Edward Hughes, Electrical Technology, Longman Scientific & Technical
5. B. L. Theraja Vol – 2, Electrical Technology, S Chand Publications
6. Guru, Hiziroglu, Electric Machinery & Transformers, Oxford University Press.

Reference Books: (As per IEEE format)

4. Fitzgerald, Electric Machinery, Sixth Edition TMH.
5. Theodore Wildi, Electrical Machines, Drives & Power systems, Pearson Education.
6. Nagrath Kothari, Electric Machines, TMH

Course Outcomes:

The student will be able to –

4. Identify the switchgear component & logical diagram.
5. calculate different parameter of d.c.machines
6. select d.c.machines for different applications
7. calculate different parameter of a.c.machines
8. select a.c.machines for different applications