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SUBJECT CODE	Category	SUBJECT NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM UNIVERSITY EXAM	TWO TERM EXAM	TEACHER ASSESSTMENT*	END SEM UNIVERSITY EXAM	TEACHER ASSESSTMENT*				
DTME301	DCS	PRODUCTION ENGINEERING	60	20	20	0	0	3	1	0	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; C - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 20 marks.

Course Educational Objectives (CEOs):

(A) To expose to the students, the different techniques of metal cuttings & machining processes. (B) To provide to the students an understanding and appreciation of the gears and thread manufacturing processes. (C) To provide a proper insight about the importance of jigs and fixtures used in production technology. (D) To provide the students with a proper understanding of non-traditional machining processes.

Course Outcomes (COs):

1. Students will be able to apply basics of metal machining processes very well with the detailed signature of tools.
2. Students able to understand different forces acting while metal cutting and can draw merchant circle diagram and also able to apply knowledge to economic metal cutting.
3. Students can able to grasp distinctive knowledge of gear forming and its generating methods.
4. Students are able to clutch its usefulness and design of such locating and fixing devises.
5. Learn in depth about press and press work
6. Gained elementary knowledge in Non-conventional machining and its application in industries

Syllabus

Unit-I

Manufacturing Processes: Definition, classification of basic manufacturing processes i, e, mechanical working, casting, metal joining processes, metal cutting process, press working. Examples of each of the above listed manufacturing

Metal Casting: Introduction, advantages and limitations of casting as production process.

Unit-II

Pattern Making: Definition of pattern, types of patterns and their details, materials, allowances, tools required Color code for patterns.

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Moulding: Definition, moulding methods and types of mould, moulding materials, moulding sand and its composition, sand properties, testing parameters of sand, and their effects, sand preparations, sand conditioning, characteristics and defects of mould. Function of runners, risers and gate. Cores and core making, core boxes. Cleaning of casting, Special casting methods, need for special casting methods, die casting, centrifugal casting, investment (lost wax) casting, casting defects, causes and analysis, area of application of casting process.
Furnaces: Cupola, crucible furnace, pit and electric arc furnaces, induction furnace, their salient features, safety aspects.

Unit - III

Press Working: Introduction of press working of metals, principle of press working, description of a simple press working unit, press working operations: punching, shearing, drawing, bending, slitting, knurling, notching, trimming, piercing etc. Double action press, description and its field of application, die and punch types of dies, specifications of a press, safety precautions to be observed while working on a press.

Unit - IV

Mechanical Working: Introduction - hot and cold working Principle of recrystallization, Metal Rolling**,** Principle of metal rolling, basic components of a simple rolling process equipment, Types of deformation during rolling. Roller material, selection and desirable properties, principles of thread rolling- description with sketches, manufacture of seamless tubes by rolling. Types of rolling mill, rolling defects. Metal Drawing, Extrusion, Extrusion defects, forging: Types of forging, die forging, differentiate between the cold die and hot die forging, advantage of forming by forging, common defects and their reasons. Limitations of forging, press forging, drop forging, upset forging, die material, applications of forging processes in engineering

Unit -V

Metal Joining: Introduction, Classification of metal joining processes Welding: -classification, Plastic, fusion and forge welding, Weldability of metals, metallurgy of welding Resistance welding: Spot, seam, butt, projection, percussion techniques. Gas welding and gas cutting: Principle of operation and technique, gas cutting. Arc Welding: Carbon arc, TIG, MIG, Submerged arc, Atomic hydrogen, Electro-slag, Plasma arc welding processes, Electrodes-types and selection, flux and their uses, Special welding techniques- Welding of different metals, Defects in welds, testing and inspection, Accident prevention in gas and arc welding Equipments & tools used in metal arc welding, specification and functions, Soldering, Brazing and Adhesive bonding.

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Reference Books:

1. *"Metal Cutting principles", by M C Shaw, Oxford University press*
2. *"Fundamentals of machining and machine tools", by Boothroyd - CRC publication*
3. *"Tool Design by Donaldson", Tata McGraw Hill Pub.*
4. *"Metal cutting Principles", by Trent McGraw Hill Pub.*
5. *"Workshop Technology Vol. II", by Raghuvanshi, Dhanpat rai Pub.*
6. *"Production Technology", by R.K. Jain, Khanna Pub.*

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SUBJECT CODE	Category	SUBJECT NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM UNIVERSITY EXAM	TWO TERM EXAM	TEACHER ASSESSTMENT*	END SEM UNIVERSITY EXAM	TEACHER ASSESSTMENT*				
DTME302	DCS	BASIC THERMODYNAMICS	60	20	20	30	20	2	1	2	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; C - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 20 marks.

Course Educational Objectives (CEOs):

(A) This subject aims at introduction of basic concepts, laws & principles of thermodynamics. (B) It covers the zeroth, first and second law of thermodynamics and heat transfer. (C) It also includes the basic principles and applications of air compressors & steam generation & steam process

Course Outcomes (COs):

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes

1. To understand the laws of thermodynamics and its applications.
2. To understand the different modes of heat, transfer in practical applications.
3. To understand the working and applications of various air compressors.
4. To understand the process of steam generation & steam process

Syllabus

Unit-I

Dimensions & Basic concepts of thermodynamics: Basic and Derived units for common engineering variables and properties like mass, length, time, temperature, area, volume, velocity, acceleration, force, pressure, work, heat, energy, power system, surroundings, boundary, universe, control volume, Properties (intensive, extensive), process, path, cycle, working substance, cyclic process, reversible, irreversible process, Thermodynamic equilibrium, zeroth law of thermodynamics, temperature & its measurement, Calorific value and types, Gas laws-Boyle`s, Charles, ideal gas equation, characteristic & universal gas constant.

Unit -II

First law & Second Law of Thermodynamic: First law of thermodynamics & Joules experiment first law applied to a process & cyclic process. Internal energy & enthalpy Determination of heat

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transfer, work transfer, internal energy change for the following process` i) Isobaric, ii) Isochoric, iii) Isothermal, iv) Adiabatic, v) Polytrophic, Steady flow energy equation for open system, first law applied to flow process` i) boiler ii) nozzle iii) turbine iv) condenser v) centrifugal pump v) compressor vi) evaporator, Throttling process.

Limitations of I law of thermodynamics, Concept of heat reservoir & heat sink, heat engine, heat pump & refrigerator, Thermal efficiency of heat engine, cop of refrigerator & heat pump. Kelvin Planck's & Clausius statements of second law of thermodynamics, Equivalence of Kelvin &Clausius statement Entropy & change in entropy during various processes.

Unit-III

Thermodynamic Cycles Steam generation & process: Air Standard cycles- definition and purpose standard efficiency, Carnot, Otto Diesel dual and Brayton cycles, their representation on PV & TS Diagrams, Derivation of air Standard efficiency and their comparison and limitation of each cycle, Vapour power cycle - Carnot cycle its limitation, Rankine cycle, modified Rankine cycle their representation on PV and TS and HS Planes, derivation of expression for thermal efficiency, Pure substance, phase transformation at constant pressure, p-v diagram for water, and various states of steam Enthalpy changes during steam formation, properties of steam & property diagrams. Process of steam, constant pressure, constant volume, reversible adiabatic, Isothermal, polytrophic& throttling process.

Unit-IV

Internal Combustion Engines: Introduction, classification I.C. Engine Components and their function, working of two stroke and four- stroke cycle engines and their comparison. Indicator diagram, Calculation of IHP, BHP thermal efficiency, Mechanical efficiency and relative efficiency, Governing, Cooling and lubrication of I.C. Engines

Unit -V

Air Compressors & Heat Transfer: Modes of heat transfer conduction, convection & radiation. Fourier`s law of conduction, good conductors & insulators, Conduction through single & multilayered slabs & cylinders, through spheres, Free & Forced convection, Combined convection & conduction, Radiation heat transfer. Heat exchangers, overall heat transfer coefficient, LMTD, Use of compressed air, classification of compressors, reciprocating air compressor, Work done during various process of compression with or without consideration of clearance volume, Isothermal & adiabatic efficiencies. F.A.D, Volumetric efficiency multistage compression, optimum stage pressure, power required & cylinder dimensions, Rotary compressors, comparison of rotary with reciprocating compressor.

Reference Books:

1. *"Engineering Thermodynamics", by P.K. Nag, McGraw-Hill Education.*
2. *"Fundamentals of Thermodynamics", by Borgnakke & Sonntag, 7th Ed. Wiley India (P) Ltd.*
3. *"Thermodynamics Engineering Approach", by Yunus Cengel & Boles, McGraw-Hill Education.*

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4. *"Engineering Thermodynamics", by Gordon Rogers and Yon Mayhew, Pearson Education Ltd.*
5. *"Engineering Thermodynamics", by Krieth, CRC Press.*
6. *"Engineering Thermodynamics", by Jones and Dugan, PHI* Learning Pvt. Ltd.

List of Experiments

1. Study of positive displacement work (PdV work) and Heat transfer for various processes.
2. Study of First Law of Thermodynamic.
3. Study of second Law of thermodynamic.
4. Determination of efficiency of Otto cycle.
5. Determination of efficiency of Diesel cycle.
6. Study of Properties of gases and gas mixtures.
7. Study of entropy of system.
8. Study of steady flow energy equation applied to nozzle, diffuser,
9. Study of steady flow energy equation applied to boiler, turbine, compressor, pump.
10. Study of steady flow energy equation applied to heat exchanger and throttling process.

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			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM UNIVERSITY EXAM	TWO TERM EXAM	TEACHER ASSESSTMENT*	END SEM UNIVERSITY EXAM	TEACHER ASSESSTMENT*				
DTME303	DCS	STRENGTH OF MATERIALS	60	20	20	30	20	2	1	2	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; C - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 20 marks.

Course Educational Objectives (CEOs):

(A) To gain knowledge of different types of stresses, strain and deformation induced in the mechanical components due to external loads. (B) To study the distribution of various stresses in the mechanical elements such as beams, shafts etc. (C) To study effect of various loading conditions of column and gain knowledge of theories of failure

Course Outcomes (COs):

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes. The students will be able to

1. Define and memorize mechanical properties of material & select appropriate material for a given working Conditions.
2. Explain simple stresses, bending stress, shear stress, torsion stress, principle stresses, thin and thick cylinder, shaft, springs, columns and theories of failures.
3. Calculate and design structural members subjected to tension, compression, torsion, bending and combined stresses using the fundamental concepts of stress, strain and elastic behavior of materials.
4. Design of shaft and pressure vessels.
5. Justify bending equation and torsion equation and use it to solve the numerical.

Syllabus

Unit-I

Introduction: Mechanical Properties, Stress- strain, uni-axial, bi-axial and tri-axial stresses, tensile & compressive stresses, shear stress, Stress Strain Diagram, Poisson's Ratio, Modulus of elasticity, Modulus of rigidity, Bulk modulus, Factor of safety, Volumetric Strain, Deformation of tapering members, Deformation due to self-weight, bars of varying sections, composite sections, principle of superposition, strain energy.

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Unit-II

Compound Stresses: Transformation of stress and strain, principal stresses, normal and shear stress, Mohr's circle and its application to two and three dimensional analyses, Thermal Stress and its applications, Stresses in thin walled pressure vessel.

Unit-III

Bending and Deflection: Bending: pure bending, symmetric member, deformation and stress, bending of composite sections, eccentric axial loading, and shear stress in beams, Deflection of beams, equation of elastic curve, Macaulay's method and Area moment method for deflection of beams.

Unit-IV

Torsion & Moment of Inertia: Torsion of circular shafts-solid and hollow, stresses in shafts when transmitting power, Strength of Shaft of varying sections and composite shaft, combined bending and torsion, strain energy due to torsion, Concept of Moment of Inertia. Radius of gyration: Parallel axis theorem, Perpendicular axis theorem.

Moment of Inertia of various sections: Rectangle, Triangle, Circle. Moment of inertia of unsymmetrical section like: T-section, channel section, L-section etc.

Unit-V

Columns and Theories of Failure: Buckling load, Types of end conditions for column, Euler's column theory and its limitations, Rankine- Gordon Formula.

Theories of failures: Maximum principal stress theory, Maximum principal strain theory, maximum shear stress theory, maximum strain energy theory, maximum shear strain energy theory; application of theories to different materials and loading conditions

Reference Books:

1. *Strenght of Materials, Dr. R.K. Bansal, Lakshmi Publications, New Delhi.*
2. *Strength of Materials, Basavarajaiah and Mahadevappa, Khanna Publishers, New Delhi.*
3. *Mechanics of Materials, James M. Gere (5th Edition), Thomson Learning*
4. *Strength of Materials—S. Ramamrutham, Dhanpat Rai Pvt. Ltd.*
5. *Mechanics of Materials—S. S. Rattan, TMH Pvt. Ltd.*
6. *Strength of Materials, Subramanyam, Oxford University Press, Edition 2005*
7. *Elements of Strength of Materials, Timoshenko and Young Affiliated East-West Press*
8. *Mechanics of Structures—S. B. Junnarkar, Charotar Publication.*
9. *Mechanics of Materials, B.C Punmia Ashok Jain, Arun Jain, Lakshmi Publications, New Delhi.*
10. *Strength of Materials, S.S. Bhavikatti, Vikas Publishing House Pvt Limited.*

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List of Experiments

1. Perform Brinell and Rockwell Hardness tests to find BHN and RHN for given specification.
2. Perform Izod/ Charpy impact test.
3. Perform Fatigue test
4. Perform Torsion test
5. To find tensile strength of given specimen by tensile test on MS and CI using UTM
6. Perform Direct/cross Shear test on MS and CI by UTM

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SUBJECT CODE	Category	SUBJECT NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM UNIVERSITY EXAM	TWO TERM EXAM	TEACHER ASSESSTMENT*	END SEM UNIVERSITY EXAM	TEACHER ASSESSTMENT*				
DTME304	DCS	MACHINE DRAWING	60	20	20	30	20	2	1	2	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; C - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 20 marks.

Course Educational Objectives (CEOs):

(A) This course provides comprehensive knowledge of production drawing, assembly drawings and orthographic Sectional views. (B) This course provides comprehensive knowledge of computer applications in production drawing assembly drawing, solid modelling & graphics standards.

Course Outcomes (COs):

On completion of this course the students will be able to acquire knowledge of the applications of computers in design, parts creation, assembling and production drawing creation, mechanism and manufacturing activity

1. Students will be able to understand all drawing conventions, symbols and concepts of machine drawing Creation.
2. Student would be able to convert functional specification of mechanical engineering parts and assembly requirements into manufacturing drawing in a manner consistent with standards.
3. Students will be able to interpret manufacturing and assembly drawings and acquire skill in preparing production drawings pertaining to various designs.

Syllabus

Unit - I

Projection and multi view Representation: Projection orthographic projection. First and third angle projection, superfluous view, choice of views, auxiliary views-views-full and partial, conversion of pictorial views into orthographic view.

Unit - II

Sectional Views: Full section, half section, partial or broken section, revolved section, removed section, offset section, Sectioning conventions, section lines, Hatching procedure for different

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materials, Sectional views of assembled parts. Choosing from IC engine parts, couplings, clutches, brackets, bearing etc. (Use 1st and3rd angle projections both)

Unit - III

Dimensioning Tolerance, Machining and Welding Symbols: Types of dimensions, dimensioning terms and notations, general rules for dimensioning and practical hints on dimensioning systems of dimensioning. Dimension of cylinder holes' arcs of circle narrow space, angles, counter sunk hole, screw threads taper etc. Application of tolerances. (Use I.S. Code 696) Machining marks, finish marks, countersinking, counter boring spot facing, figures and notes for same, Representation of characteristics machining (circularity, Angularity etc.) (Ref IS 969) Representation of welded joints, welding symbols, tolerance of forms and positions. Procedure of drawing fits, limits, size, tolerance, clearance etc.

Unit-IV

Production Drawing: Detailed drawing, assembly drawing, scale, finish tolerances, notes etc. Title block, tool list, gauge list, Preparation of production drawing for pattern shop, forging shop, machine shop, preparation of assembly drawing from detailed drawing. exploded views, sectional pictorial views, assembly drawing of nut and bolt, Plummer block, flange coupling, stepped pulleys, foot-step bearing, Universal coupling, connecting rod, piston of I.C. engines, cotter joint, knuckle joint, Preparation of detailed drawing from assembly drawings and assembled pictorial views, Interpretation of production drawing.

Unit -V

Pipe Drafting Gear Drawing: Various symbols used in pipe line work as per IS code of Practice, C.I. flanged joint, socket and spigot joint, gland and stuffing box, expansion joint, pipe fitting typical pipe bends, pipe supports and accessories, Gear terminology such as pitch, pitch circle diameter module, addendum, root circle diameter, hole depth, blank diameter etc. construction of cycloidal, involute teeth profiles, pinion and rack mashing, spur gear mashing.

Unit -VI

Graph and Charts: Introduction, Classification of chart, graphs and diagrams, quantitative and qualitative charts and graphs, Drawing and curve titles, legends note etc. procedure for making a graphical representation in ink. Logarithmic graphs, semi logarithmic graphs, bar charts area (Percentage) charts, pie chart, alignment charts (Nomo graphs) Forms and construction, construction of functional scale, parallel scale charts for equations of the form (t) +f(u) +f (v), (f

(t) f (u) = f (v)] three scale alignment chart, graphical construction of a Z- chart, four variable relationship parallel scale alignment chart.

Reference Books:

1. *Machine drawing- N.D. Bhatt. & V.M. Panchal, published by Charotar Publishing house.*

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2. *Machine Drawing & Design, Dr. K.K. Dwivedi & Dr. M. Pandey, Dhanpat Rai Publications.*
3. *Machine drawing – P.S. Gill S.K. Kataria & Sons Delhi.*
4. *Fundamentals of Machine Drawing by Sadhu Singh & Shah, PHI*
5. *Machine drawing – T. Jones.*
6. *Machine Design by-J.E. Shigly-McGraw Hill Publications.*
7. *Design of Machine Elements from V.B. Bhandari, TMH Publications.*
8. *Introduction to Engineering Design, McGraw Hill.*
9. *Mastering CAD George Omura with Brian Benton Autodesk.*
10. *Machine Design – P.C. Sharma & D.K. Agrawal-Kataria & Sons Publications.*
11. *Principles of Mechanical Design - R. Phelan – McGraw Hill Pub.*
12. *Machine Design - An Integrated Approach Robert-L-Norton Published by Addison Wesley Longman*
13. *(Singapore) Machine Design – M. F. Spott – PHI*
14. *Machine Design, Theory & Practice – J. Michels Walter, E. Wilson Charles – Add MacMilan Publishers, New York.*

List of Experiments

1. Assembly Drawing and design problem as per given syllabus.

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SUBJECT CODE	Category	SUBJECT NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM UNIVERSITY EXAM	TWO TERM EXAM	TEACHER ASSESSTMENT*	END SEM UNIVERSITY EXAM	TEACHER ASSESSTMENT*				
DTME305	DCS	MATERIAL SCIENCE	60	20	20	0	0	2	1	0	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; C - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 20 marks.

Course Educational Objectives (CEOs):

(A) To acquaint students with the basic concepts and properties of Material Science. (B) To impart a fundamental knowledge of Materials Processing. (C) Selection and application of different Metals & Alloys. (D) To understand the structure of Engineering Materials.

Course Outcomes (COs):

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes

1. An ability to apply advanced science (such as Chemistry and Physics) and engineering principles to material systems.
2. An integrated understanding of the scientific and engineering principles underlying the four major elements of the field of Metallurgical and Materials Engineering, namely structure, properties, processing and performance related to materials systems appropriate to the field.
3. An ability to apply and integrate knowledge from each of the four elements of the field (structure, properties, processing and performance) to solve materials selection and design problems.
4. An ability to design a system, component or process to meet desired needs.

Syllabus

Unit-I

Introduction & Structure of Metals: Introduction to engineering materials , Classification of materials, Classification and Properties of Materials Thermal, chemical, electrical, mechanical properties of various materials , Selection criteria for use in industry, destructive including Tensile test, compression test, hardness test, impact test fatigue test, endurance limit, bending test, shear test and non- destructive testing methods, Metal structure, Arrangement of atoms in metals, crystalline structure of metals unit cells and crystal structure (B.C.C., F.C.C. and H.C.P) allotropy. Crystal imperfection and their effects on properties, Deformation of metal.

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Unit - II

Iron- Carbon Equilibrium System &Equilibrium Phase Diagrams: Equilibrium of phase Diagrams: Plotting of equilibrium diagrams, interpretation, phase rule and lever rule and its application Phase transformations – Eutectic Eutectoid, Peritectic.

Practical Metallography Preparation of specimen, selecting the specimen, mounting the specimen, grinding, polishing, etching and etching reagents. The metallurgical microscope. Use and care of microscope, Classification of iron and steel, Sources of Iron ore and its availability, Manufacture of pig iron, wrought iron, cast iron and steel, Effect of various alloying elements on steel The complete iron carbon diagram and its interpretation. The solidification and cooling of various carbon steels, structures produced correlation of mechanical properties with carbon content.

Unit - III

Heat Treatment of Steels: Objective of heat treatment, thermal processes- annealing, normalizing, hardening and tempering. Hardening process, Surface hardening, flame hardening, case hardening methods, their scope, limitations and advantages, quenching mediums and their effect on hardness, Hardening defects due to improper quenching, hardenability, Jominy end quench test and interpretation of its results. TTT curve interpretation and use, Isothermal heat treatment processes Martempering, Austempering, spherodising and patenting.

Unit - IV

Ferrous & Non- Ferrous Metals and Alloys: Introduction Metallic Materials and Non Metallic Materials ferrous material & nonferrous material, Classification, types of cast irons, alloy cast-irons, various alloying elements, Classification, composition and uses of plain carbon steels, effect of impurities, Alloy steels, various alloying elements, their effects on properties, Alloy steel classification, Tool Steel, Typical compositions, requirements of steels tool, high speed steel, high carbon steel, Standardization of steels, Designation of steals as per B.I.S. codes. Copper, Cooper Bases Alloys, Brasses, their classification, composition, properties and uses, designation of copper alloys as per B.I.S. aluminum, Aluminum Alloys, their composition, Classification, properties and uses. Designation of Al- alloys as per B.I.S, Zinc, and Nickel and lead their alloys properties and uses bearing alloys - their composition and field of application.

Unit - V

Powder Metallurgy & Engineering Plastics and Fibers: Introduction and application, Description of process, manufacture and blending of metal powder compacting and sintering. Corrosion meaning various mechanism effect of corrosion, methods of minimizing corrosion Introduction and use of plastics and fibers, Classification of plastic (Thermoplastic and thermosetting) Classification of fibers (Inorganic and organic fibers).

Reference Books:

1. *Material Science & Metallurgy for Engineers", Dr. V.D. Kodgire & S. V. Kodgire, Everest Publication.*
2. *Mechanical Behavior & Testing of Materials, A. K. Bhargava, C.P. Sharma.P H I Learning Private Ltd.*

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3. *Introduction to Physical Metallurgy, Avner, S.H., Tata McGraw-Hill, 1997.*
4. *Mechanical Metallurgy, Dieter, G.E., McGraw-Hill, 1988.*
5. *Material Science and Metallurgy, U. C. Jindal, Pearson Edu., 2012*
6. *Science of Engineering Materials, Smith, Prentice-Hall*
7. *Materials Science and Engineering, Callister W. D., John Wiley*
8. *"Engineering Metallurgy", Higgins R. A., Viva books Pvt. Ltd., 2004.*
9. *"Material Science & Engg." Raghvan V., Prentice Hall of India, New Delhi. 2003*

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SUBJECT CODE	Category	SUBJECT NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM UNIVERSITY EXAM	TWO TERM EXAM	TEACHER ASSESSTMENT*	END SEM UNIVERSITY EXAM	TEACHER ASSESSTMENT*				
DTME306	DCS	COMPUTER AIDED DRAFTING	0	0	0	60	40	0	0	6	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; C - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 20 marks.

Course Educational Objectives (CEOs):

To paraphrases with (A) CAD related application with it and its need, (B) 2-D and 3-D modeling terms, draw editing commands and utility commands.

Course Outcomes (COs):

After completion of this course the student are expected to be able to demonstrate following knowledge skills and attitudes. The student will be able to

1. Student would be able to understand CAD, its application and limitation.
2. Student would be able to use 2-D drawing, editing commands and its applications.
3. Student would be able to solve assembly related problems.

Syllabus

Unit-1

Introduction to Cad Software: Introduction – History of CAD – Applications – Advantages over manual drafting – Hardware requirements – Software requirements – Windows desktop – CAD screen interface – menus – Tool bars – How to start CAD – How to execute command – types of co-ordinate systems – Absolute – Relative – Polar.

Unit - II

Drawing Aids and Editing Commands: Creating objects (2D) – Using draw commands – Line, Arc, Circle, Ellipse, Donut, Polygon, Point, Plane, Sketch, Trace – Creating 2D Solid. Creating text – Text, Text, Text styles – Milne, spline – Drawing with precision – Snap options – drafting settings –limits – Units – drawing aids – Fill, Snap, Grid, Ortho lines – Function keys - Editing and modify commands – Object selection methods – Erasing object – Oops - Cancelling and undoing a command – Copy – Move – Array – Offset – Scale – Rotate – Mirror – Break – Trim – Extend – Explode. Divide – Measure – stretch – Lengthen – Changing properties – Color – line

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Year 2nd **Sem 3rd**

types –LT scale – Matching properties – Editing with grips – Pewit – Debit – Mladic.

Unit - III

Basic Dimensioning, Hatching, Blocks and Views: Basics of dimensioning – Editing dimensions – Dimension styles – Dimension system variables, Machine drawing with CAD. Creation of blocks – Block – inserting a block – Block attributes – Hatching –Pattern types – Boundary hatch – working with layers - Controlling the drawing display – Blip mode – View group commands – Zoom, redraw, regen, regenerator, pan, viewers – Real time zoom, Inquiry groups – calculating area – Distance – Time – Status of drawing – Using calculator.

Unit - IV

Isometric Drawing, Printing and Plotting: Isometric drawing – Isometric projection – drawing– is circles – Dimensioning isometric objects. File commands – File Import and export – plotting drawing – external references – 3D fundamentals – 2D to 3D Conversion 3D Drawing: 3D Primitives-Extrude – Revolve-Slice-Section, Surface 3D Mesh- 3D - Surface-3D Operation-Solid Editing.

Reference Books:

1. *An Introduction to ComputerAided Design (CAD) by A. Mustun*
2. *Mastering AutoCAD 2016 and AutoCAD LT 2016 by G. Omura*
3. *AutoCAD 3D Training Manual by K.S. Kurland*
4. *CAD/CAM: Principles and Application by Rao*
5. *Computer Aided Manufacturing by Rao*
6. *CAD/CAM: Theory and Practices by Zeid*