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SEMESTER III

COURSE CODE	CATEGORY	COURSE 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		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 and classification of basic manufacturing processes i.e., forging, casting, metal joining processes, metal cutting process and press working; examples of each of the above listed manufacturing.

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UNIT -II

Metal Casting: Introduction; advantages and limitations of casting; Definition of pattern, their types, material selection and allowances; Moulding-Definition, types of mould, moulding materials, moulding sand and its composition; 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; Die casting, centrifugal casting, investment (lost wax) casting; casting defects, causes, remedies and applications.

Furnaces: Cupola, crucible, pit, electric arc furnaces and induction furnace with their salient features; safety aspects.

UNIT - III

Press Working: Introduction of press working of metals; principle of press working; press working operations-punching, shearing, drawing, bending, slitting, knurling, notching, trimming and piercing (brief description); Double action press; description and its field of application, types of dies; specifications of a press; safety precautions to be observed while working on a press.

UNIT - IV

Mechanical Working: Introduction of hot and cold working; advantages and limitations; Metal Rolling; Principle of metal rolling; basic components of a simple rolling process equipment; Types of rolling mill; Rolling defects; Metal Drawing; Extrusion; Types of extrusion; Extrusion defects; forging-Types of forging, die forging, differentiate between the cold die and hot die forging; Limitations of forging, drop forging and upset forging.

UNIT -V

Metal Joining: Introduction; Classification of metal joining processes; Welding classification, Resistance welding-Spot, seam, butt, projection and percussion techniques; Gas welding and gas cutting-Principle of operation, working and applications; Arc Welding-TIG, MIG, Submerged arc, Atomic hydrogen, Electro-slag and Plasma arc welding ; Electrodes- types and selection; flux and their uses; Defects in welds; Soldering, Brazing and Adhesive bonding.

Reference Books:

1. *Metal Cutting principles, by M C Shaw, Oxford University press, 1960.*
2. *Production Technology - H.M.T. By HMT, 2001.*
3. *Workshop Technology Vol. II by Raghuvanshi, Dhanpat rai Pub, 2006.*
4. *Production Technology by R.K. Jain, Khanna Pub, 2001.*
5. *Manufacturing Technology Vol.-1 by P.N. Rao,TMH Pub, 2018.*

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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*				
DTME302		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, 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 First 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

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 & properties diagrams. Process of steam, constant pressure, constant volume, reversible adiabatic, Isothermal, polytrophic& throttling process.

UNIT-IV

Vapour power cycle: Carnot cycle its limitation, Rankine cycle, modified Rankine cycle their representation on P-V and T-S and H-S Planes, derivation of expression for thermal efficiency,

Air Standard cycles: Air Standard cycles- definition and purpose standard efficiency, Carnot, Otto Diesel dual Derivation of air Standard efficiency and their comparison and limitation of each cycle.

UNIT -V

I.C. Engine-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

Reference Books:

1. *Engineering Thermodynamics by P.K. Nag, McGraw-Hill Education 2011.*
2. *Thermal Engineering by R.K. Rajput, Laxmi Publication House, 2010.*
3. *Engineering Thermodynamics by Onkar Singh,New Age International Publication,2013.*
4. *A Textbook of Engineering Thermodynamics by V.M. Domkundwar, Dhanpat Rai & Company, 2008.*
5. *Engineering Thermodynamics by Jones and Dugan, PHI Learning Pvt. Ltd. 2001.*

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List of Practical's:

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.

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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		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):

On completion of this course the students will be able to understand

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; Define Stress and strain; tensile, compressive stresses and shear stress; Stress-Strain Diagram; Poisson's Ratio, Modulus of elasticity, Modulus of rigidity and Bulk modulus; Factor of safety; Deformation due to self-weight; bars of varying sections; composite sections; principle of superposition and strain energy.

UNIT-II

Compound Stresses: principal stresses, normal and shear stress, Mohr's circle, Thermal Stress

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and its applications, Introduction of thin walled cylindrical pressure vessel; Hoop's and longitudinal stress in thin walled cylindrical pressure vessel.

UNIT-III

Bending: Define bending and their assumptions; Pure bending; bending equation; Section Modulus; deformation and stress occur due to bending; bending of composite sections; shear stresses in beam for different section.

UNIT-IV

Torsion: Define torsion and their assumptions; Torsion Equation; Polar Modulus; Torsion of circular shafts-solid and hollow; Strength of Shaft for varying sections and composite shaft; combined bending and torsion.

UNIT-V

Columns and Theories of Failure: Buckling load; Types of end conditions for column; Euler's column theory and its limitations; Define Theories of failures-Maximum principal stress theory, Maximum principal strain theory, maximum shear stress theory, maximum strain energy theory and maximum shear strain energy theory.

Reference Books:

1. *Strenght of Materials, Dr. R.K. Bansal, Lakshmi Publications, New Delhi, 2016.*
2. *Strength of Materials, Basavarajaiah and Mahadevappa, Khanna Publishers, New Delhi, 2003.*
3. *Strength of Materials—S. Ramamrutham, Dhanpat Rai Pvt. Ltd., 2017.*
4. *Mechanics of Materials—S. S. Rattan, TMH Pvt. Ltd. 2010.*
5. *Strength of Materials, Subramanyam, Oxford University Press, Edition, 2005.*

List of Practical's:

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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			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM UNIVERSITY EXAM	TWO TERM EXAM	TEACHER ASSESSTMENT*	END SEM UNIVERSITY EXAM	TEACHER ASSESSTMENT*				
DTME304		MACHINE DRAWING	60	20	20	20	30	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 modeling & 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

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 with conventions; Application of tolerances (Use I.S. Code 696) Machining marks, finish marks, countersinking and counter boring spot facing; Representation of characteristics machining (circularity and Angularity), (Ref IS 969); Representation of welded joints, welding symbols, tolerance of forms and positions; Procedure of drawing fits, limits, size, tolerance and clearance.

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UNIT - II

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

UNIT - III

Sectional Views: Full section, half section, partial or broken section, revolved section, removed section and offset section; Sectioning conventions; section lines; Hatching procedure for different materials; Sectional views of assembled parts; Choosing from IC engine parts, couplings and bearing.

UNIT-IV

Assembly Drawing: Detailed drawing; assembly drawing; scale, finish tolerances and bill of material; Preparation of assembly drawing from detailed drawing; Exploded views; sectional pictorial views; assembly drawing of nut and bolt; Pedestal bearing, foot step bearing and journal bearing; cotter joint and knuckle joint; Preparation of detailed drawing from assembly drawings and assembled pictorial views.

UNIT -V

Riveted Joints and Gear Drawing: Types of rivet heads; Failure of riveted joints; Different types of riveted joints lap joint and butt joint; chain riveting and zigzag riveting; Gear terminologies; Studies of cycloidal, involute teeth profiles, rack and pinion meshing; spur gear meshing.

Reference Books:

1. *Machine drawing- N.D. Bhatt. & V.M. Panchal, published by Charotar publishing house, 2003.*
2. *Machine Drawing & Design, Dr. K.K. Dwivedi & Dr. M. Pandey, Dhanpat Rai Publications, 2007.*
3. *Machine drawing – P.S. Gill S.K. Kataria & Sons Delhi, 2009.*
4. *Fundamentals of Machine Drawing by Sadhu Singh & Shah, PHI, 2011.*
5. *Machine Design by-J.E. Shigly-McGraw Hill Publications 2005.*

List of Practical's:

Assembly Drawing and design problem as per given syllabus.

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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*				
DTME305		MATERIALS 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 and Properties of Materials; Destructive test includes-Tensile test, compression test, hardness test, impact test, fatigue test, endurance limit, bending test and shear test; 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.

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UNIT - II

Phase Diagrams and Iron- Carbon Equilibrium System: Equilibrium of phase Diagrams; phase rule and lever rule and its application; Phase transformations-Eutectic, Eutectoid, Peritectic and Peritectoid reaction; iron-carbon diagram and its application; cooling behavior of various carbon steels.

UNIT - III

Heat Treatment: Types of heat treatment; Annealing, Normalizing, Quenching, Tempering (Austempering and Martempering) and various case hardening processes; Time Temperature Transformation (TTT) diagrams.

UNIT - IV

Ferrous & Non- Ferrous Materials: Introduction; Metallic and Non Metallic Materials; ferrous material & Nonferrous material; Define Cast Iron their types and applications; Define steel, types and application; various alloying elements used in steel with their effects on properties.

UNIT - V

Powder Metallurgy, Engineering Plastics and Fibers: Introduction and application; Description of process; manufacturing and blending of metal powder; compaction and sintering; Corrosion, 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 and Metallurgy, U. C. Jindal, Pearson Edu., 2012.*
2. *Science of Engineering Materials, Smith, Prentice-Hall, 2005.*
3. *Materials Science and Engineering, Callister W. D., John Wiley, 2015.*
4. *"Engineering Metallurgy", Higgins R. A., Viva books Pvt. Ltd., 2004.*
5. *"Material Science & Engg." Raghvan V., Prentice Hall of India, New Delhi. 2003*
6. *Introduction to Physical Metallurgy, Avner, S.H., Tata McGraw-Hill, 1997.*

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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*				
DTME306		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.

List of Practical's:

1. Setting up of drawing environment by setting drawing limits, drawing units, naming the drawing, naming layers, setting line types for different layers using various type of lines in engineering drawing, saving the file with .dwg extension.
2. Layout drawing of a building using different layer and line colours indicating all Building details. Name the details using text commands, Make a title Block.
3. To Draw Orthographic projection Drawings (Front, Top and side) of safety valve, knuckle joint, cotter joint & Plummer block etc.
4. Make an Isometric dimensioned drawing from orthographic drawings.
5. Draw different types of bolts and nuts with internal and external threading in Acme and square threading standards. Save the bolts and nuts as blocks suitable for insertion.
6. Draw 3D models by extruding, revolve, sweep, loft & other 3D Modelling commands in AutoCAD.

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7. Prepare Assembled 3d cad models of knuckle joint, cotter joint & Plummer block through Creo cad modelling software.
8. Apply Constraints & Mechanism on 4 bar & piston cylinder mechanism through Creo Mechanism tools.

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