Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore

Shri Vaishnav Institute of Technology and Science

Choice Based Credit System (CBCS) Scheme in light of NEP-2020

B. Tech/B. Tech + MBA in Automobile Engineering

(2021-2025)

COURSE CODE	CATEGORY	COURSE NAME	TEACHING &EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTAU301	DCC	ENGINEERING MATERIALS	60	20	20	0	0	3	0	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 10 marks.

Course Educational Objectives (CEOs):

(A) To acquaint students with the basic concepts and properties of Material Engineering.
(B) To impart a fundamental knowledge of Materials geometry and structures.
(C) Selection and application of different Metals & Alloys.
(D) To understand the concept of heat treatment and material testing.

Course Outcomes (COs):

1. To impart the knowledge of various ferrous and non-Ferrous materials.
2. Students will be able to understand the material geometry and structure.
3. To impart the knowledge of alloy formation and heat treatment.
4. To impart the knowledge of various material testing methods.

Syllabus

9 Hrs.

Unit-I

Introduction: Scope & requirement of engineering materials, Classification, Properties of engineering materials, Ferrous materials & its alloys, Non-ferrous materials and its alloys, Effect of alloying elements on the mechanical properties of Steel & C.I., Material selection process.

Unit-II **9 Hrs.**

Crystal geometry and crystal defects: Space lattice, unit cell, different types of crystal structures, Bravias lattices, atomic packing factor and density, crystal planes and directions, Defects in solids, Linear defects, Slip & plastic deformation, Planar defects, Volume defects, Volume defects.

Unit-III **10 Hrs.**

Theory of alloys and phase transformations: Basic terms, solid solutions, Phase rules, phase diagrams, time temperature cooling curves, equilibrium diagrams, eutectic system, eutectoid system, peritectic system, peritectoid system, rate of transformation, nucleation and growth, micro-constituents of iron-carbon system, Iron-Carbon Diagram, formation of austenite, TTT diagram.

Unit-IV **8 Hrs.**

Heat Treatment: Various applications of heat treatment, heat treatment process; Annealing, Normalizing, Hardening, Quenching, Tempering (Austempering, Martempering), and various case hardening processes, heat treatment furnaces, heat treatment defects.

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Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
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Unit-V **9 Hrs.**

Material Testing: Various mechanical properties and their testing; tensile testing, Stress strain diagram, hardness testing, toughness testing, fatigue testing and creep testing etc. Overview of Destructive Testing and Non-Destructive testing (NDT), advantages and disadvantages of NDT.

Reference Books:

1. *"Materials Science and Engineering", Callister W. D., John Wiley*
2. *"Engineering Metallurgy", Higgins R. A., Viva books Pvt. Ltd., 2004.*
3. *"Material Science & Engg." Raghvan V., Prentice Hall of India, New Delhi. 200.*
4. *"Science of Engineering Materials", Smith, Prentice-Hall*
5. *"Introduction to Physical Metallurgy", Avner, S.H., Tata McGraw-Hill, 1997.*
6. *"Mechanical Metallurgy", Dieter, G.E., McGraw-Hill, 1988.*
7. *"Material Science and Metallurgy", U. C. Jindal, Pearson Edu., 2012.*
8. *"Material Science & Metallurgy for Engineers", Dr. V.D. Kodgire & S. V. Kodgire, Everest Publication.*
9. *"Mechanical Behavior & Testing of Materials", A. K. Bhargava, C.P. Sharma. P H I Learning Private Ltd.*
10. *"Material Science" G.K. Narula et al. McGraw Hill education (India) Pvt. Ltd.*

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			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTME302	DCC	PRODUCTION PROCESS	60	20	20	30	20	3	0	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 10 marks.

Course Educational Objectives (CEOs):

The primary objective of the course is to describe and develop knowledge of (A) Casting tools and techniques, (B) joining processes such as welding, brazing, soldering etc. (C) forming processes such rolling, extrusion, forging and sheet metal working (D) machining processes and metal cutting technology.

Course Outcomes (COs):

After completion of this course the students will be able to understand and describe the

1. Types of manufacturing processes and casting tools and methods.
2. Joining processes such as welding, brazing, soldering etc.
3. Machining processes, operations and metal cutting technology.
4. Forming processes such as rolling, extrusion, deep drawing, forging and sheet metal working.

Syllabus

Unit – I **(9 Hrs)**

Introduction: Definition, classification of manufacturing processes, importance of manufacturing.

Metal Casting Processes: Introduction to casting and foundry; basic principles of casting; pattern: functions of patterns, types of patterns, pattern allowances, materials used for patterns; pattern design considerations, core, core boxes; moulding: moulding materials, types of mouldings, moulding sand properties and testing, core sand and core making, gating system, runner and riser, pouring and feeding, degasification etc. in casting, various types of casting processes, casting defects.

Unit - II **(9 Hrs)**

Joining Processes: Classification of joining processes, principle of welding, soldering, brazing and adhesive bonding; Types of welding processes: arc welding and gas welding processes, TIG welding, MIG welding, spot welding, resistance welding, submerged arc welding, plasma arc welding, thermit welding, electron beam welding, laser beam welding, defects and inspection of welding joints, electrodes, weldability of metals, welding equipments, difference between welding, soldering and brazing.

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BTME302	DCC	PRODUCTION PROCESS	60	20	20	30	20	3	0	2	4

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Unit - III **(9 Hrs)**

Rolling, Extrusion and Wire Drawing: Introduction, advantages of mechanical rolling processes, difference between hot and cold working, advantages and disadvantages of cold and hot working processes, types of rolling mills, rolling defects; extrusion of metals: types of extrusion processes, metal flow in extrusion, extrusion equipment & dies, defects and their remedies; wire drawing: classification, advantages, limitations and applications.

Unit – IV **(10 Hrs)**

Forging and Sheet Metal Working:

Forging: Introduction, classification of forging, open die and closed die forging, types of forging operations, types of forging presses, common forging defects

Sheet Metal Working: Sheet Metal properties, miscellaneous sheet metal working operations: shearing & slitting, punching, blanking, coining, piercing, trimming, perfecting, notching, lancing, embossing, stamping, rubber forming, stretch forming, curling, bending, drawing, deep drawing etc. press tool, types of dies used, force requirement, theory of shear, methods of force reduction, lubricants used, pressure and power requirements, defects and their remedies, slitting tools and shear blades.

Unit – V **(8 Hrs)**

Introduction of Metal Cutting and Machining Operations: Metal cutting tools, types of cutting tools and tool materials, single point and multipoint cutting tools and related terms, types of chips formed; working principles, main components and common operations of lathe machines, shaper and planer machines, milling, grinding and drilling machines

Text and Reference Books:

1. "Workshop Technology" by W. A. J. Chapman part I, II & III, 5th ed., 2001.
2. "Manufacturing Technology" by P. N. Rao, Vol. 1 and 2, 2016.
3. "Fundamentals of Machining and Machine Tools" by D.G. Boothroy and W.A. Knight, Marcel Dekker, NY, 2007.
4. "Production Technology" by R.K. Jain and S.C. Gupta, Khanna Publishers. 16th Edition, 2008.

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BTME302	DCC	**PRODUCTION PROCESS**	60	20	20	30	20	3	0	2	4

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***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

5. "Elements of Workshop Technology" by Hazra Chaudhary Vol I, II, 12th ed., 2007.
6. "Metal Cutting Theory and Practice" by Bhattacharya, New Central Book Agency, 2000.
7. "Principles of Metal Cutting" by G. Kuppuswamy, Universities Press, 2006.
8. "Fundamentals of Metal Cutting and Machine Tools" by B.L. Juneja and G.S. Sekhon, New Age International, 2010.

List of Experiments:

1. To study different types of patterns.
2. To study properties of casting sand and casting defects.
3. To prepare a mould using moulding sand and pattern.
4. To study various types of welding and welding defects.
5. To make a lap joint with the help of electric arc welding.
6. To make the lap joint with the help of TIG welding.
7. To study and prepare a job using resistance welding (spot welding).
8. To study various types of rolling mills.
9. To study various types of forging tools and operations.
10. To study various sheet metal operations.
11. To study various types of cutting tool and their geometry.
12. To study basic features of various metal cutting machinery and their operations.

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			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTME303	DCC	STRENGTH OF MATERIALS	60	20	20	30	20	3	1	2	5

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***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 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 **(8 Hrs)**

Introduction: Stress-Strain, uni-axial, bi-axial and tri-axial stresses, tensile & compressive stresses, shear stress, Stress Strain Diagram, Ratio, Modulus of elasticity, Modulus of rigidity, Bulk modulus, Factor of safety.

Unit – II **(9 Hrs)**

Simple & Compound Stresses: Deformation due to self-weight, bars of varying sections, composite sections, principle of superposition, strain energy, 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.

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Unit – III **(10 Hrs)**

Bending and Deflection: Symmetric member, Deflection of beams, deformation and stress, bending of composite sections, Macaulay's method and Area moment method for deflection of beams

Unit – IV **(8 Hrs)**

Torsion: Torsion of circular shafts-solid and hollow, Strength of Shaft and composite shaft, combined bending and torsion, strain energy due to torsion.

Unit – V **(10 Hrs)**

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.

Text and Reference Books:

1. Strength of Materials, Dr. R.K. Bansal, Lakshmi Publications, New Delhi, 2015
2. Strength of Materials, Basavarajaiah and Mahadevappa, Khanna Publishers, New Delhi, 2013
3. Mechanics of Materials, James M. Gere (5th Edition), Thomson Learning, 2005
4. Strength of Materials—S. Ramamrutham, Dhanpat Rai Pvt. Ltd.
5. Mechanics of Materials—S. S. Rattan, TMH Pvt. Ltd., 2010
6. Strength of Materials, Subramanyam, Oxford University Press, Edition 2005
7. Elements of Strength of Materials, Timoshenko and Young Affiliated East-West Press, 2012
8. Strength of Materials, Singer Harper and Row Publications, 2005
9. Mechanics of Structures—S. B. Junnarkar, Charotar Publication, 2015

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***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

10. Mechanics of Materials, B.C Punmia Ashok Jain, Arun Jain, Lakshmi Publications, New Delhi, 2014
11. Strength of Materials—W. Nash, Schaum's Outline Series, McGraw Hill Publication, 2014
12. Strength of Materials, S.S. Bhavikatti, Vikas Publishing House Pvt Limited, 2016

List of Experiments

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

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BTAU307	DCC	AUTOMOTIVE THERMAL SYSTEM	60	20	20	30	20	3	0	2	4

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***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs):

(A)To gain knowledge of Basic Concepts of thermodynamics, (B) law of Thermodynamics, (C) Energy, Entropy and Exergy, (D) Gas Power cycles and (E) conduction, convection and radiation.

Course Outcomes (COs):

After learning the course, the students should be able to

1. Understand basic terms used in thermodynamics.
2. Understand laws of thermodynamics and its applications.
3. Comprehend the concept and applications of energy, entropy and exergy.
4. Understand various gas and vapor power cycles.
5. Solve/describe the problems related to heat transfer by conduction, convection and radiation.

Syllabus

Unit – I **10 Hrs**

First Law and Energy: Basic Concepts, Concept of Continuum, Microscopic and Macroscopic Approach, Thermodynamic Systems (Closed, Open, Isolated), Control Volume, Property, Point and Path Functions, Thermodynamic Equilibrium, State, Path and Process, Reversible and Quasi-Static Process, Work, Modes of Work, Zeroth Law, Concept of Temperature and Heat. First Law, Application to Closed and Open Systems, Internal Energy, Enthalpy, Specific Heat Capacities (Cp & Cv), Steady flow process with reference to various engineering devices. Limitations of first law of thermodynamics

Unit – II **8 Hrs**

Second Law, Entropy and Exergy: Second Law – Kelvin Planck and Clausius Statements, Heat Engine, P-V, P-T, T-V, T-S and H-S Diagrams, PVT Surfaces, Refrigerator and Heat Pump, Efficiency and COP, Carnot Cycle, Clausius Inequality, Concept of Entropy, Entropy of Ideal Gases, Principle of Increase of Entropy, Quality of Energy, Exergy (Availability).

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Unit – III **10 Hrs**

Thermodynamics Cycles: Recapitulation of Carnot, Otto and Diesel cycle, Dual cycle, Comparison of Otto, Diesel and Dual cycles, air standard efficiency, brake thermal efficiency, relative efficiency.

Gases and Gas Mixtures: Properties of Ideal and Real Gases, Avogadro's Hypothesis and Gas Laws, Vander Walls and Other Equations of State, Non-Reactive Ideal Gas Mixtures, Mass and Mole Fractions, Dalton's Law of Additive Pressures, Amagat's Law of Additive Volumes, Properties of Ideal Gas Mixtures.

Unit – IV **8 Hrs**

Conduction Heat Transfer: Basic laws of heat transfer i.e. Conduction, Convection and Radiations; Fourier equation and Thermal Conductivity, Steady State Conduction, Heat conduction through plane wall, Composite wall and cylindrical wall. effect of variable conductivity.

Unit – V **9 Hrs**

Convection Heat transfer: Free and forced convection, Laminar and Turbulent flow, Newton- Rekhman Law: Convection rate equation, Nusselt Number; radiation heat exchanger; salient features and characteristics of radiation. Absorptive, reflectivity and transmittance, wavelength distribution of black body radiation, Plank's law; total emissive power: Stefan Boltzman law, Kirchoffs Law, gray body and selective emitters.

Text and 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.*
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.*
7. *"Heat and mass transfer" by Sukhatme SP, University Press Hyderabad, 2005.*

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BTAU307	DCC	**AUTOMOTIVE THERMAL SYSTEM**	60	20	20	30	20	3	0	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 10 marks.

8. *"Heat transfer" by Holman JP, TMH, 2011*
9. *"Heat and Mass Transfer" by Nag PK, TMH, 2007.*
10. *"Heat Transfer Principles and App, by Dutta BK, PHI Learning, 2015.*

List of experiments

1. To Study of positive displacement work (PdV work) and Heat transfer for various processes.
2. To Study of First Law of Thermodynamic.
3. To Study of second Law of thermodynamic.
4. To determine the efficiency of Otto cycle.
5. To determine the efficiency of Diesel cycle.
6. To determine the efficiency of Dual cycle.
7. To Study of Properties of gases and gas mixtures.
8. To determine the thermal conductivity of a metallic rod
9. To determine Forced and free convection over circular cylinder.
10. To find the effectiveness of a pin fin in a rectangular duct natural convective condition and plot temperature distribution along its length.
11. To verify the Stefen-Boltzmann constant for thermal radiation

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ML307 ENVIRONMENTAL MANAGEMENT AND SUSTAINABILITY

SUBJECT CODE	CATEGORY	SUBJECT NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
ML-307	Compulsory	Environmental Management and Sustainability	60	20	20	0	0	4	0	0	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher's Assessment** shall be based upon following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objective

1. To create awareness towards various environmental problems.
2. To create awareness among students towards issues of sustainable development.
3. To expose students towards environment friendly practices of organizations.
4. To sensitize students to act responsibly towards environment.

Examination Scheme

The internal assessment of the students' performance will be done out of 40 Marks. The semester Examination will be worth 60 Marks. The question paper and semester exam will consist of two sections A and B. Section A will carry 36 Marks and consist of five questions, out of which student will be required to attempt any three questions. Section B will comprise of one or more cases / problems worth 24 marks.

Course Outcomes

1. The course will give students an overview of various environmental concerns and practical challenges in environmental management and sustainability.
2. Emphasis is given to make students practice environment friendly behavior in day-to-day activities.

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COURSE CONTENT

Unit I: Introduction to Environment Pollution and Control

1. Pollution and its types (Air, Water, and Soil): Causes, Effects and Control measures
2. Municipal Solid Waste: Definition, Composition, Effects
3. Electronic Waste: Definition, Composition, Effects
4. Plastic Pollution: Causes, Effects and Control Measures

Unit II: Climate Change and Environmental Challenges

1. Global Warming and Green House Effect
2. Depletion of the Ozone Layer
3. Acid Rain
4. Nuclear Hazards

Unit III: Environmental Management and Sustainable Development

1. Environmental Management and Sustainable Development: An overview
2. Sustainable Development Goals (17 SDGs)
3. Significance of Sustainable Development
4. Environment Friendly Practices At Workplace and Home (Three Rs' of Waste Management, Water Conservation, Energy Conservation)

Unit 1V: Environmental Acts

1. The Water (Prevention and Control of Pollution) Act, 1974: Objectives, Definition of Pollution under this act, Powers and Functions of Boards
2. The Air (Prevention and Control of Pollution) Act, 1981:Objectives, Definition of Pollution under this act, Powers and Functions of Boards
3. The Environment (Protection) Act, 1986: Objectives, Definition of important terms used in this Act, Details about the act.
4. Environmental Impact Assessment: Concept and Benefits

Unit V:Role of Individuals, Corporate and Society

1. Environmental Values
2. Positive and Adverse Impact of Technological Developments on Society and Environment
3. Role of an individual/ Corporate/ Society in environmental conservation
4. Case Studies: The Bhopal Gas Tragedy, New Delhi's Air Pollution, Arsenic Pollution in Ground Water (West Bengal), Narmada Valley Project, Cauvery Water Dispute,Fukushima Daiichi Disaster (Japan), Ozone Hole over Antarctica, Ganga Pollution, Deterioration of Taj Mahal, Uttarakhand flash floods

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Suggested Readings:

1. Rogers, P.P., Jalal, K.F. , Boyd, J.A.(Latest Edition) . **An Introduction to Sustainable Development.** Earthscan
2. Kalam, A.P.J. (Latest Edition) .***Target 3 Billon: Innovative Solutions Towards Sustainable Development.*** Penguin Books
3. Kaushik , A. and Kaushik (Latest Edition).***Perspectives in Environmental Studies***. New Delhi: New Age International Publishers.
4. Dhameja, S.K. (Latest Edition). ***Environmental Studies***. S.K. Kataria and Sons.New Delhi
5. Bharucha,E. (Latest Edition). ***Environmental Studies for Undergraduate Courses.*** New Delhi: University Grants Commission.
6. Wright, R. T. (Latest Edition). ***Environmental Science: towards a sustainable future*** .New Delhi: PHL Learning Private Ltd.
7. Rajagopalan, R. (Latest Edition). ***Environmental Studies***. New York: Oxford University Press.

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Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore
Shri Vaishnav Institute of Technology and Science
Choice Based Credit System (CBCS) Scheme in light of NEP-2020
B. Tech/B.Tech+MBA in Mechanical Engineering
(2021-2025)

COURSE CODE	CATEGORY	COURSE NAME	TEACHING &EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTME305	DCC	MACHINE DRAWING	0	0	0	30	20	0	0	4	2

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
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Course Educational Objectives (CEOs):

This course provides comprehensive knowledge of (A) production drawing, (B) assembly drawings and (C) orthographic Sectional views and use of (D) computer applications in production drawing.

Course Outcomes (COs):

On completion of the course the students will be able to:

1. Understand all drawing conventions, symbols and concepts of machine drawing Creation.
2. Convert functional specification of mechanical engineering parts and assembly requirements into manufacturing drawing in a manner consistent with standards.
3. Interpret manufacturing and assembly drawings and acquire skill in preparing production drawings pertaining to various designs.
4. Acquire knowledge of the applications of computers in design, parts creation, assembling and production drawing creation, mechanism and manufacturing activity.

Syllabus

Unit – I **(14 Hrs)**

Introduction of Machine Drawing and Drawing Conventions: Introduction, classification of machine drawings, principles of drawing, elements of drawing, types of machine drawing, Drawing standards, Drawing Instruments, sheet layout and title block, Application of types of lines, lettering and numbering, Sketching, Dimensioning, screw threads, screw fastening bolt, nut, washer, screw, locking arrangements of nuts, foundation bolts, keys, cotter-joints and pin joint, pipe joint and valves, Riveted joints and welded joints, shaft bearings, brackets and hangers, shaft coupling, clutches and brakes.

Drawing Conventions and Symbols: Conventional materials, Conventional breaks, Convention of rivets and bolts, welding conventions, Convention of roughness of surface, Convention of machine operation and parts, Convention of gear and gear transmission, convention of springs, Symbolic Representation of fasteners, Holes and bolts, profile section, pipe fittings and valve symbols, Electric symbol.

Unit – II **(14 Hrs)**

Production Drawing Elements and Assembly Drawings: Introduction, geometric tolerance

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types and representation, dimensional tolerance types and representation, Limits and fits, hole basis and shaft basis system of fits, surface roughness, indication of surface roughness, roughness value and grade symbol, Assembly concepts, introduction, types, sequence of preparing the assembly drawing, sectional views, convention in sectioning, bill of materials, plotting techniques.

Assembly drawing

Shaft joints: knuckle joint, cotter joints and types etc.

Keys & Shaft coupling: Muff, Flanged, Flexible, Universal and Oldham's coupling etc.

Pipe joint: Flanged joint, Socket and Spigot joint, Hydraulic joint, Union joint, Gland & Stuffing Box etc.

Bearing: Plummer block, Pedestal bearing etc.

Engine Parts: Steam engine, Piston, connecting rod, Stuffing box, cross head, crank shaft etc.

Unit – III **(14 Hrs)**

Orthographic Conversion, Sectional and Interpretation of Views: Principle and method of projection, orthographic projection, first angle, third angle, isometric, oblique and perspective projection, conversion of pictorial views into orthographic views illustrative problems,

Sectional views and Interpretation: Types of sectional views, full section, half section, partial section, removed section, revolved section, offset section, sectioning conventions. Reading of orthographic views, blue print reading, missing lines and views, identification of planes, illustrative problems.

Unit – IV **(14 Hrs)**

Production and Assembly Drawing Creation through CAD: Introduction to CAD, Why CAD Software, Scope, objective, benefit and limitations, CAD Interface, Coordinate system, Create Objects and Modify Object. Layers & Blocks, Text, Table & Dimensions, Introducing Printing, Plotting, and Layouts.

Drawing practice sheet: Indicate the surface roughness symbols, welding symbols, tolerances, all production drawing symbols and conventions in drawing practice sheets of AutoCAD Mechanical.

Parts Assembly, Visualization & Graphics standards: Assembly Creation methods, Parts Modeling & Representation, Assembly Constraints, Mechanism & Mechanism Analysis, Mass Properties, Data exchange standards; IGES STEP CALS DXF STL.

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BTME305	DCC	**MACHINE DRAWING**	0	0	0	30	20	0	0	4	**2**

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Reference Books:

1. Machine drawing- N.D. Bhatt. & V.M. Panchal, Charotar publishing house, 2015.
2. Machine Drawing & Design, Dr. K.K. Dwivedi & Dr. M. Pandey, Dhanpat Rai Publications, 2015
3. Machine drawing – P.S. Gill S.K. Kataria & Sons Delhi, 2016
4. Fundamentals of Machine Drawing by Sadhu Singh & Shah, PHI, 2014
5. Machine drawing – T. Jones., 2007.
6. Machine Design by-J.E. Shigly-McGraw Hill Publications, 2010.
7. Design of Machine Elements from V.B. Bhandari, TMH Publications, 2014
8. Introduction to Engineering Design, McGraw Hill, 2015
9. Mastering CAD George Omura with Brian Benton Autodesk, 2004
10. Machine Design – P.C. Sharma & D.K. Agrawal, Kataria & Sons Publications, 2014
11. Principles of Mechanical Design - R. Phelan – McGraw Hill Pub., 2011
12. Machine Design - An Integrated Approach Robert-L-Norton Published by Addison Wesley Longman, 2015
13. Machine Design, Theory & Practice – J. Michels Walter, E. Wilson Charles – Add MacMilan Publishers, New York, 2010

List of Experiments:

Various Drawing problems according to syllabus.

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