



# Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore

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

Year 2<sup>nd</sup>

Sem. 3<sup>rd</sup>

| SUBJECT CODE | Category | SUBJECT NAME          | TEACHING & EVALUATION SCHEME |               |                     |                         |                     |   |   |   |         |
|--------------|----------|-----------------------|------------------------------|---------------|---------------------|-------------------------|---------------------|---|---|---|---------|
|              |          |                       | THEORY                       |               |                     | PRACTICAL               |                     | L | T | P | CREDITS |
|              |          |                       | END SEM UNIVERSITY EXAM      | TWO TERM EXAM | TEACHER ASSESSMENT* | END SEM UNIVERSITY EXAM | TEACHER ASSESSMENT* |   |   |   |         |
| BTAU301      | DCS      | 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 20 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

### 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

**Crystal geometry and crystal defects:** Space lattice, unit cell, different types of crystal structures, Bravais 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

**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.

  
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**Unit-IV**

**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.

**Unit-V**

**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 | TEACHER ASSESSMENT* | END SEM UNIVERSITY EXAM | TEACHER ASSESSMENT* |   |   |   |         |
| BTAU302      | DCS      | MANUFACTURING 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 20 marks.

**Course Educational Objectives (CEOs):**

The purpose of the Production Process course is to aware students about cutting tools and various production processes. The course will help students to:

- (A) Use and understand the verbal and symbolic language used to describe production systems and phenomenon. (B) Develop and present creative solutions to present and future production problems. (C) Identify and investigate potential career opportunities in the area of production. (D) Understand the evolution of production processes and its influence on our culture.

**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 select and apply the knowledge, techniques, skills, and modern tools of the discipline to broadly-defined engineering technology activities;
2. Able to describe different casting processes
3. Able to describe and apply different welding techniques.
4. Able to describe and apply different operations in lathe machine. Milling machine, shaper and planner machines.

**Syllabus**

**Unit - I**

**Introduction:** Introduction to manufacturing process and importance of manufacturing for humankind, machine tools and their parts, types of cutting tools and tool materials, tool signature, Mechanisms of formation of chips, types of chips formed, chip Breakers, Factors causing wear, tool life, variables affecting tool life.

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**Unit - II**

**Metal Casting Processes:** Introduction to casting and foundry; basic principles of casting processes; Casting types sequence in foundry operations; Pattern making, material and allowances of pattern, Molding practice; ingredients of molding sand and core sand, Properties of sand. Sand testing; different molding processes. Defects in casting

**Unit - III**

**Metal Cutting Processes:** Importance of material removal, elements of metal machining, General principles working and commonly performed operations in the following machines: Lathe, Shaper, Planer, Horizontal milling machine Universal drilling machine, Cylindrical grinding machine, Capstan and Turret lathe, Economics of machining.

**Unit - IV**

**Metal Joining Process:** Introduction to metal joining process; Types of welding processes. Arc Welding & 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 & Inspection of Welding Joints, Electrodes, weldability of Metals, Welding equipment's, Differentiate between welding, soldering and brazing.

**Unit - V**

**Metal Forming Processes:** Fundamental of hot and cold working processes. Types and operation of processes: -Forging, press working, extrusion, rolling, process of shearing, punching, piercing, blanking, trimming, perfecting, notching, lancing, embossing, coining, bending, forging and drawing; press, tool dies, auxiliary equipment, safety devices, stock feeders, scrap cutters, forces, pressure and power requirements

**Reference Books:**

1. *Workshop Technology* By W. A. J. Chapman, part I, II & III, CBS Publishers & Distributors Pvt. Ltd.
2. *Manufacturing processes* by P. N. Rao, Vol. 1 and 2, McGraw Hill
3. *Elements of Workshop Technology* Hazra Chaudhary Vol I, II., Media Promoters and Publishers Pvt.
4. *Metal cutting Theory & Cutting Tool Designing* by V. Arshinov, G Alekseev.
5. *Principle of Metal cutting* by Sen & Bhattacharya
6. R.K. Jain and S.C. Gupta, "Production Technology", Khanna Publishers. 16th Edition, 2001.

**List of Experiments**

1. To study various types of cutting tool and their geometry.
2. To study different types of patterns.
3. To study properties of casting sand and casting defects.
4. To study the characteristic features of lathe.

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5. To perform various lathe operations such as facing, plain turning, step turning and taper turning on a given material made of Mild steel.
6. To study the characteristic features of shaper and milling machine.
7. To study the characteristic features of universal drilling machine.
8. To study various types of welding and welding defects.
9. To make a lap joint with the help of electric arc welding.
10. To make the lap joint with the help of TIG welding.
11. To study various farming tools & operations.
12. To perform various farming operations on given specimen.

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|--------------|----------|------------------------|------------------------------|---------------|---------------------|-------------------------|---------------------|---|---|---|---------|
|              |          |                        | THEORY                       |               |                     | PRACTICAL               |                     | L | T | P | CREDITS |
|              |          |                        | END SEM UNIVERSITY EXAM      | TWO TERM EXAM | TEACHER ASSESSMENT* | END SEM UNIVERSITY EXAM | TEACHER ASSESSMENT* |   |   |   |         |
| BTAU303      | DCS      | MECHANICS OF MATERIALS | 60                           | 20            | 20                  | 30                      | 20                  | 3 | 1 | 2 | 5       |

**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- 1

**Introduction:** 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.

### Unit- II

**Simple & Compound Stresses:** Definition, Deformation due to self-weight, bars of varying

  
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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.

### Unit-III

**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

**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

**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. *Strength 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. *Strength of Materials*, Singer Harper and Row Publications
9. *Mechanics of Structures*—S. B. Junnarkar, Charotar Publication.
10. *Mechanics of Materials*, B.C Punmia Ashok Jain, Arun Jain, Lakshmi Publications, New Delhi.
11. *Strength of Materials*—W. Nash, Schaum's Outline Series, McGraw Hill Publication.
12. *Strength of Materials*, S.S. Bhavikatti, Vikas Publishing House Pvt Limited.

### 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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|--------------|----------|----------------|------------------------------|---------------|---------------------|-------------------------|---------------------|---|---|---|---------|
|              |          |                | THEORY                       |               |                     | PRACTICAL               |                     | L | T | P | CREDITS |
|              |          |                | END SUM UNIVERSITY EXAM      | TWO TERM EXAM | TEACHER ASSESSMENT* | END SUM UNIVERSITY EXAM | TEACHER ASSESSMENT* |   |   |   |         |
| BTAU304      | DCS      | THERMODYNAMICS | 60                           | 20            | 20                  | 30                      | 20                  | 3 | 1 | 2 | 5       |

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 Basic Concepts of thermodynamics. (B)To study of First law of Thermodynamics. (C)To gain knowledge of Second law of thermodynamics. (D)To gain knowledge of Entropy and Entropy. (E)To study of Gas Power cycles. (F)To study of Properties of gases and gas mixtures.

### 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. Understand the properties of gas mixtures.

## Syllabus

### Unit - 1

**Basic Concepts:** Microscopic & macroscopic point of view, thermodynamic system and control volume, thermodynamic properties, processes and cycles, work and heat, Thermodynamic equilibrium, Quasi-static process, work transfer and heat transfer processes.

**First law of Thermodynamics:** First law for a closed system undergoing a cycle and change of state, energy, PMM1, first law of thermodynamics for steady flow process, steady flow energy equation applied to nozzle, diffuser, boiler, turbine, compressor, pump, heat exchanger and throttling process, filling and emptying process.

### Unit - II

**Second law of thermodynamics:** Limitations of first law of thermodynamics, Kelvin-Planck and Clausius statements and their equivalence, PMM2, causes of irreversibility, Carnot theorem, corollary of Carnot theorem, thermodynamic temperature scale.

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**Unit - III**

**Entropy:** Clausius theorem, property of entropy, inequality of Clausius, entropy change in an irreversible process, principle of increase of entropy, entropy change for non-flow and flow processes, third law of thermodynamics.

**Unit - IV**

**Energy:** Energy of a heat input in a cycle, exergy destruction in heat transfer process, exergy of finite heat capacity body, exergy of closed and steady flow system, irreversibility and Gouy-Stodola theorem and its applications, second law efficiency.

**Unit - V**

**Gas Power cycles:** Recapitulation of Carnot, Otto and Diesel cycle, Dual cycle, Comparison of Otto, Diesel and Dual cycles, air standard efficiency, mean effective pressure, brake thermal efficiency, relative efficiency, Brayton cycle, effect of reheat, regeneration, intercooling and turbine and compressor efficiency on Brayton cycle.

**Properties of gases and gas mixtures:** Avogadro's law, equation of state, ideal gas equation, Vander Waal's equation, reduced properties, law of corresponding states, compressibility chart, Gibbs-Dalton law, internal energy; enthalpy and specific heat of gas mixtures.

**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.

**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, boiler, turbine, compressor, pump, and heat exchanger and throttling process.

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|--------------|----------|---------------------------|------------------------------|---------------|---------------------|-------------------------|---------------------|---|---|---|---------|
|              |          |                           | THEORY                       |               |                     | PRACTICAL               |                     | L | T | P | CREDITS |
|              |          |                           | END SEM UNIVERSITY EXAM      | TWO TERM EXAM | TEACHER ASSESSMENT* | END SEM UNIVERSITY EXAM | TEACHER ASSESSMENT* |   |   |   |         |
| BTAU305      | DCS      | MACHINE COMPONENT DRAWING | 0                            | 0             | 0                   | 30                      | 20                  | 0 | 0 | 4 | 2       |

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):

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 – 1

**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

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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 symbols.

### Unit – II

**Production Drawing Elements and Assembly Drawings:** Introduction, geometric tolerance 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

**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

**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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### Reference Books:

1. Machine drawing- N.D. Bhatt. & V.M. Panchal, published by Charotar publishing house.
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. Machine Design, Theory & Practice – J. Michels Walter, E. Wilson Charles – Add MacMilan Publishers, New York.

### List of Experiments

Drawing problems as per given syllabus.

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|--------------|----------|----------------------|------------------------------|---------------|---------------------|-------------------------|---------------------|---|---|---|---------|
|              |          |                      | THEORY                       |               |                     | PRACTICAL               |                     | L | T | P | CREDITS |
|              |          |                      | END SEM UNIVERSITY EXAM      | TWO TERM EXAM | TEACHER ASSESSMENT* | END SEM UNIVERSITY EXAM | TEACHER ASSESSMENT* |   |   |   |         |
| BTAU306      | DCS      | ENGINE COMPONENT LAB | 0                            | 0             | 0                   | 30                      | 20                  | 0 | 0 | 2 | 1       |

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):

1. Basic understanding of engine components.
2. Identify various parts of different engines.
3. Impart knowledge of functions of various parts of engines.

### Course Outcomes (COs):

After learning the course the students should be able to:

- (1). Students will be able to identify various engine components.
- (2). Students will be able to describe functions of engine components.
- (3). Students will be able to identify engines on the basis of engine parts.

### Syllabus

Study of various four-stroke and two-stroke spark-ignition and compression ignition engines and components by dismantling and assembling various parts. Comparison of different types of engines and their components.

### List of Experiments

1. Describe various parts of 4 stroke petrol (S.I.) engine and their functions.
2. Describe various parts of 4 stroke diesel (C.I.) engine and their functions.
3. Describe various parts of 2 stroke diesel (C.I.) engine and their functions.
4. Describe various parts of 2 stroke diesel (C.I.) engine and their functions.
5. Differentiate 4 stroke petrol and diesel engine and their parts.
6. Differentiate 2 stroke petrol and diesel engine and their parts.
7. Differentiate 4 stroke and 2 stroke engine on the basis of their parts.

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### ML-301 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-301       | 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 IV: 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

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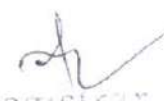
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4. Case Studies: The Bhopal Gas Tragedy, New Delhi's Air Pollution, Arsenic Pollution in Ground Water (West Bengal), Narmada Valley Project, Cauvery Water Dispute, Fukushima Daiichi Disaster (Japan), Ozone Hole over Antarctica, Ganga Pollution, Deterioration of Taj Mahal, Uttarakhand flash floods

### 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 Billion: 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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