



**Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore**  
**Shri Vaishnav Institute of Technology and Science**  
**Choice Based Credit System (CBCS) in the Light of NEP-2020**  
**Diploma in Automobile Engineering (2021-2024)**

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*					
DTAU301	DC	AUTOMOBILE ENGINES	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 10 marks.

**Course Educational Objectives (CEOs):**

This course provides a fundamental understanding (A) To impart the knowledge of working of I.C. engines (B) To impart the knowledge of fuel injection and ignition system (C) To impart the detail knowledge of fuel combustion (D) To develop the knowledge of cooling and lubrication system of IC engines (E) To impart the ability of determination of engine performances through testing.

**Course Outcomes (COs):** After completion of this course the students are expected to be able to demonstrate following knowledge, skills, and attitudes

1. Demonstrate the working of IC engines.
2. Describe the fuel injection and ignition system.
3. Explain the fuel combustion within IC engine.
4. Understand the cooling and lubrication system.
5. Evaluate Engine performance.

**Syllabus**

**UNIT I**

**8 Hrs.**

**Air Standard Cycles:** Internal and external combustion engines, classification and applications of I.C. Engines, IC engine components and terminology, four stroke cycle engines and two stroke cycle engines, Assumptions made in air standard cycle, Otto cycle, diesel cycle, dual combustion cycle, comparison of Otto, diesel and dual combustion cycles, Stirling and Ericsson cycles, air standard efficiency, specific work output, specific weight, work ratio, mean effective pressure, deviation of actual engine cycle from ideal cycle, valve and port timing diagrams.

**UNIT II**

**9 Hrs.**

**Carburetion:** Factors influencing carburetion, mixture requirements for various operating

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			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
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**Legends:** L - Lecture; T - Tutorial/Teacher Guided Student Activity; P - Practical; C - Credit.

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conditions, types of carburetors.

**Fuel Injection System:** Functional requirements of an injection system, types of injection

systems, components of injection system.

**Ignition System:** Requirements of ignition system, battery ignition system, magneto ignition system, electronic ignition system, firing order, ignition timing.

### UNIT III

8 Hrs.

**Combustion in S.I. engines:** Stages of combustion in S.I. engines, effect of engine variables on ignition lag, combustion phenomenon, knock in S.I. engines, effects of engine variables on knock, combustion chamber for S.I. engines.

**Combustion In C.I. engines:** Stages of combustion in C.I. engines, variables affecting delay period, knock in C.I. engines, C.I. engine combustion chambers.

### UNIT IV

8 Hrs.


**Lubrication and Cooling Systems:** Functions of a lubricating system, types of lubrication system; mist, wet sump, and dry sump systems; crankcase ventilation, properties of lubricant, SAE rating of lubricants, engine performance and lubrication, necessity of engine cooling, effect of engine variables on engine wear transfer, different types of cooling systems.

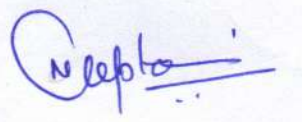
### UNIT V


9 Hrs.

**Engine measurements and Testing:** Friction power, indicated power, brake power, fuel and air consumption, speed, temperature of coolant and exhaust, noise, and emission measurement. Pollution and Hi Control: Pollutants from S.I. and C.I. engines, Methods of emission control, alternative fuels for I.C. Engines, catalytic converter.

### Textbooks:

  
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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*				
DTAU301	DC	AUTOMOBILE ENGINES	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 10 marks.

1. J.B. Heywood, "Internal Combustion Engine Fundamentals", 5<sup>th</sup> edition, McGraw-Hill, 2018.
2. Paul W. Gill & James H. Smith, "Fundamentals of Internal Combustion Engines", 4th edition, Oxford & IBH Pub. Ltd. 2007.
3. V. M. Domkundwar "A Course in Internal Combustion Engines ". 3rd edition, Dhanpat Rai Publication 2018.
4. V Ganesan, ""Internal Combustion Engines", 2nd edition, Tata McGraw-Hill
5. ML. Mathur & R.P. Sharma, "Internal Combustion Engines ". 4th edition, Dhanpat Rai

**List of Experiments.**

1. To study the working of 2 stroke and 4 stroke petrol (S.I.) engine
2. To study the working of 2 stroke and 4 stroke diesel (C.I.) engine
3. To study valve/port timing diagram of I.C. Engines.
4. To study fuel injection and ignition system of both S.I. & C.I. engines.
5. To study the different lubrication systems of I.C. engine.
6. Evaluate performance of 4-stroke C.I. engine and prepare heat balance sheet.
7. Evaluate performance of 2-stroke C.I. engine and prepare heat balance sheet.
8. Performance evaluation of four stroke S.I. engine.
9. Performance evaluation of two stroke S.I. engine
10. Performance evaluation of multi-cylinder Diesel/Petrol Engine

  
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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*				
DTME302	DC	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**

**8 Hr.**

**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.

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**UNIT -II**

**9 Hr.**

**First law & Second Law of Thermodynamic:** First law of thermodynamics & Joules experiment first law applied to a process & cyclic process. Determination of heat transfer, work transfer and internal energy change for thermodynamic processes. Limitations of First law of thermodynamics, Thermal efficiency of heat engine, cop of refrigerator & heat pump. Kelvin Planck's & Clausius statements of second law of thermodynamics.

**UNIT-III**

**8 Hr.**

**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, polytropic & throttling process.

**UNIT-IV**

**8 Hr.**

**Vapor power cycle:** Carnot cycle its limitation, 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 standard efficiency of Carnot, Otto, Diesel and dual cycle.

**UNIT -V**

**8 Hr.**

**I.C. Engine-**Introduction, classification I.C. Engine Components and their functions, 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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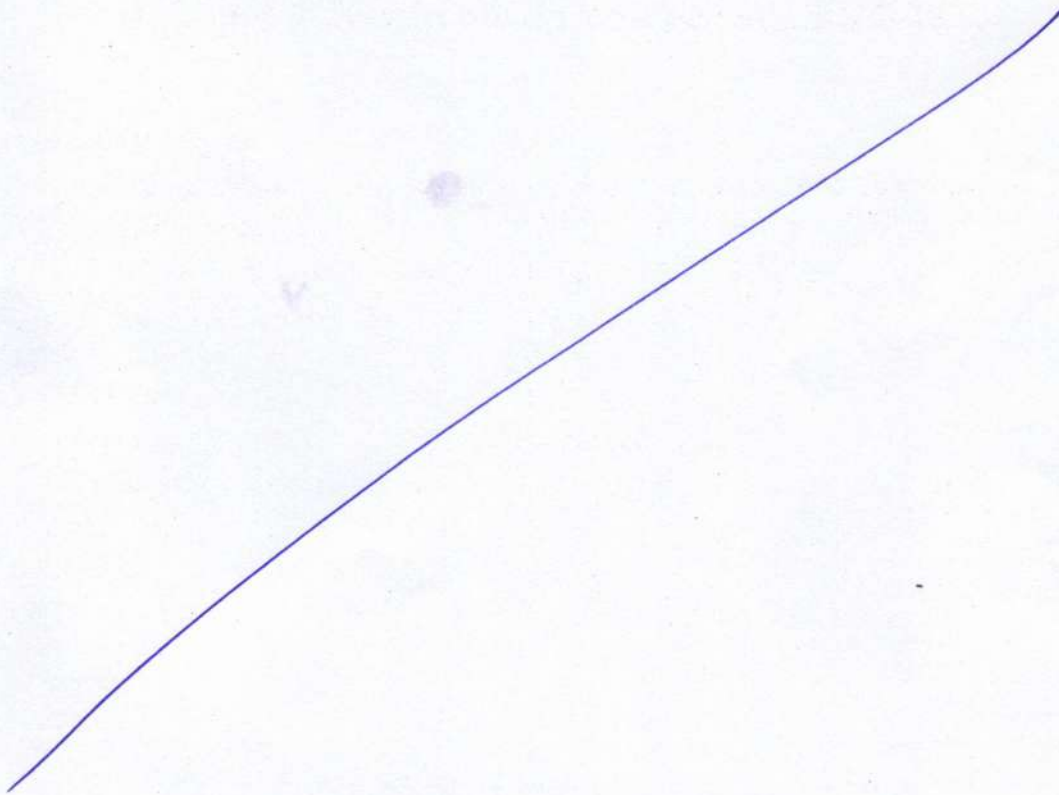




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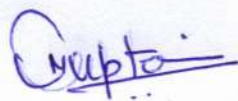
**List of Practical's:**

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 ASSESSMENT*	END SEM UNIVERSITY EXAM	TEACHER ASSESSMENT*				
DTME303	DC	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, principal 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:** Mechanical Properties; Define Stress and strain; tensile, compressive stresses and shear stresses; 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**

**7 Hrs.**

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**Compound Stresses:** principal stresses, normal and shear stress, Mohr's circle, Thermal Stress and its applications, Introduction of thin-walled cylindrical pressure vessel; Hoop's and longitudinal stress in thin-walled cylindrical pressure vessel.

**UNIT-III**

**7 Hrs.**

**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**

**7 Hrs.**

**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**

**8 Hrs.**

**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. *Strength of Materials, Dr. R.K. Bansal, Lakshmi Publications, New Delhi, 2016.*
2. *Strength of Materials, Basavaraj 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.

  
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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 ASSESSMENT	END SEM UNIVERSITY EXAM	TEACHER ASSESSMENT				
DTME304	DC	MACHINE 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):**

(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**

**6 Hrs.**

**Dimensioning Tolerance, Machining and Welding Symbols:** Types of dimensions; dimensioning terms and notations, screw threads taper with conventions; Application of tolerances (Use I.S. Code 696) Machining marks,

  
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finish marks, machining (circularity and Angularity), (Ref IS 969); Representation of welded joints, welding symbols, Procedure of drawing fits, limits, size, tolerance, and clearance.

**UNIT – II**

**7 Hrs.**

**Projection and multi view Representation:** Orthographic projection; First and third angle projection; choice of views; conversion of pictorial views into orthographic view.

**UNIT – III**

**7 Hrs.**

**Sectional Views:** Full section, half section, partial or broken section, revolved section, and offset section; Sectioning conventions; section lines; Hatching procedure for different materials; Sectional views of assembled parts.

**UNIT-IV**

**7 Hrs.**

**Assembly Drawing:** Detailed drawing; assembly drawing; scale, and bill of material; Preparation of assembly drawing from detailed drawing; Exploded views; assembly drawing of Pedestal bearing, footstep bearing and journal bearing; cotter joint and knuckle joint.

**UNIT -V**

**6 Hrs.**

**Riveted Joints:** Types of rivet heads; Different types of riveted joints lap joint and butt joint; chain riveting and zigzag riveting.

**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:**

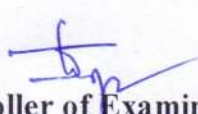
Assembly Drawing and design problem as per given syllabus.

  
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			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM UNIVERSITY EXAM	TWO TERM EXAM	TEACHER ASSESSMENT*	END SEM UNIVERSITY EXAM	TEACHER ASSESSMENT*				
DTME305	AEC	COMPUTER AIDED DRAFTING	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):**

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):**

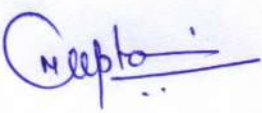
After completion of this course the student are expected to be able to demonstrate following knowledge skills and attitudes. The student will be able to

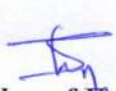
1. Student would be able to understand CAD, its application and limitation.
2. Student would be able to use 2-D drawing, editing commands and its applications.
3. Student would be able to solve assembly related problems.


**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 Mechanical Parts - safety valve, knuckle joint, cotter joint & Plummer block etc.
4. Make an Isometric dimensioned drawing from orthographic drawings.

  
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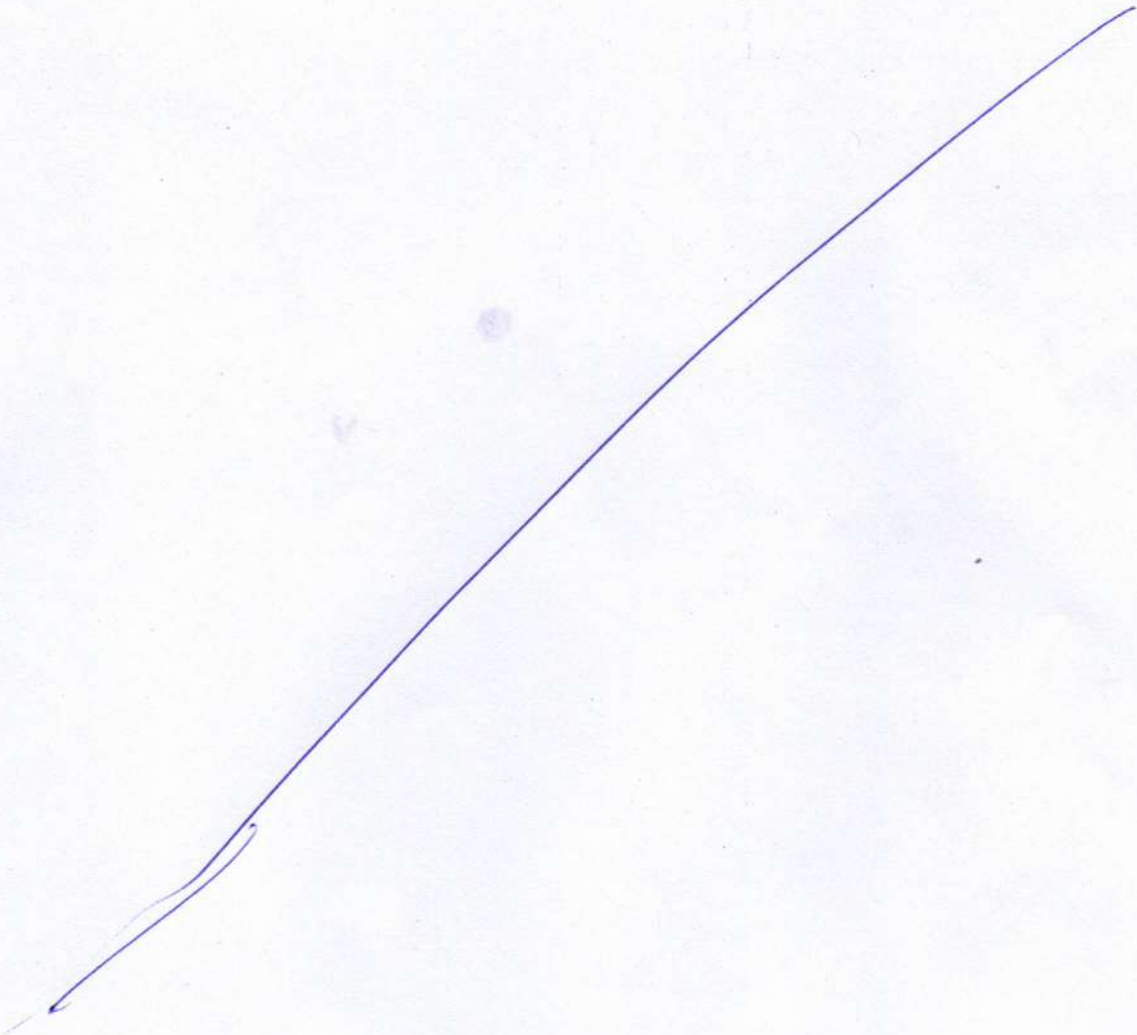
  
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**Shri Vaishnav Institute of Technology and Science**  
**Choice Based Credit System (CBCS) in the Light of NEP-2020**  
**Diploma in Mechanical Engineering (2021-2024)**

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.
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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### 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 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
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 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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