# Chhattisgarh Swami Vivekananda Technical University, Bhilai

**Name of program: Bachelor of Technology Branch:All Branches** **Semester: III**
**Subject: Mathematics – III** **Code: B000311(014)**
**Total Theory Periods: 03** **Total Tutorial Periods: 01**
**Class Tests: Two (Minimum)** **Assignments: Two (Minimum)**
**ESE Duration: Three Hours** **Maximum Marks: 100** **Minimum Marks: 35**

**Course Objectives:**

1. To provide knowledge of Laplace transform of elementary functions including its properties and applications to solve ordinary differential equations.
2. To have thorough knowledge of partial differential equations which arise in mathematical descriptions of situations in engineering.
3. To study about a quantity that may take any of a given range of values that can't be predicted as it is but can be described in terms of their probability.
4. To provide a thorough understanding of interpolation and methods to solve ordinary differential equation.

UNIT-I Laplace transform: Definition, Transform of elementary functions, Properties of Laplace transform, Transform of derivatives & integrals, Multiplication by $t^n$, Division by t, Evaluation of integrals, Inverse Laplace Transform, Convolution theorem, Unit step function, Unit impulse function, Periodic function, Application to solution of ordinary differential equations.

**UNIT- II Partial differential equation:** Formation, Solution by direct integration method, Linear equation of first order, Homogeneous linear equation with constant coefficients, Non-homogeneous linear equations, Method of separation of variables.

**UNIT- III Random variable:** Discrete and continuous probability distributions, Mathematical expectation, Mean and Variance, Moments, Moment generating function, probability distribution, Binomial, Poisson and Normal distributions.

**UNIT- IV Interpolation with equal and unequal intervals:** Finite differences, Newton's Forward & Backward Difference Formulae, Central Difference Formula, Stirling's Formula, Bessel's Formula, Lagrange's Formula and Newton's Divided Difference Formula.

**UNIT-V Numerical Solution of Ordinary Differential Equations**: Picard's Method, Taylor's Series Method, Euler's Method, Euler's Modified Method, Runge-Kutta Methods, Predictor-corrector Methods- Milne's Method, Adams-Bashforth Method.

**Text Books:**


1. "Higher Engg. Mathematics", Dr. B.S. Grewal– Khanna Publishers.
2. "Advanced Engg. Mathematics" , Erwin Kreyszig – John Wiley & Sons.
3. "Numerical Methods in Engineering and Science" , Dr. B.S. Grewal, Khanna Publishers.
4. "Numerical Methods for Scientific and Engineering Computation" , M .K. Jain, S. R. K


**Reference Books:**


1. "Applied Mathematics", P. N. Wartikar& J. N. Wartikar. Vol-II Pune Vidyarthi Griha Prakashan, Pune.
2. "Applied Mathematics for Engineers & Physicists", Louis A. Pipes- TMH.
3. "Numerical Methods for Scientists and Engineers" K. Shankar Rao, Prentice Hall of India.
4. "Numerical Methods" P. Kandasamy, K. Thilagavathy and K. Gunavathi, S. Chand publication.


**Course outcomes:** After studying the contents of the syllabus in detail the students will be able to: Define (mathematically) unit step unit impulse, Laplace transform its properties, inverse and applications to solve ordinary differential equations and find Numerical solution of differential equations, which may be arising due to mathematical modelling based on engineering problems. Hands on these Mathematical topics will make them equipped to prepare for higher studies through competitive examinations.

# Chhattisgarh Swami Vivekanand Technical University,Bhilai

Name of program: **Bachelor of Technology**
Branch: **Automobile Engineering**
Subject: **Engineering Thermodynamics**
Total Theory Periods: **03**
Class Tests: **Two (Minimum)**
ESE Duration: **Three Hours**

Semester: **III**
Code: **B082312(037)**
Total Tutorial Periods: **01**
Assignments: **Two (Minimum)**
**Maximum Marks: 100**
**Minimum Marks: 35**

***Course Objectives:***

1. To introduce students to basic concepts and first laws of thermodynamics.
2. To impart knowledge of concepts of second law of thermodynamics and entropy.
3. To introduce students to exergy and related concepts.
4. To study about properties of real gases and mixture of ideal non-reactive gases.
5. To provide an understanding ofproperties of pure substances.

**UNIT I: (a) Introduction to Engineering Thermodynamics**-Macroscopic vs microscopic view point,Thermodynamic System, properties, process, cycle, thermodynamic equilibrium, Quasi-static Process,Zeroth Law of thermodynamics, concept of continuum. Exact & Inexact differentials. Work-electrical,magnetic, gravitational, spring and shaft work, Displacement work, flow work, free expansion, workdonein various quasistatic process,work as a path function. Heat transfer-sensible heat, latent heat, heat as apath function.
(b) **First Law of thermodynamics**-Joule's experiment, internal energy as property of system, firstlaw applied to various quasistatic process,PMMI, Limitations of the First Law, control volume, Steadyflow energy equation, Applications of SFEE.

**UNIT II: (a) Second law of thermodynamics:** Thermal Reservoir, Heat Engine, cyclic Heat engine,Kelvin-Planck statement and Clausius Statements and their Equivalence, Refrigerator and Heat pump,COP, PMMII, ,reversibility and irreversibility, causes of irreversibility, Carnot cycle, reversed heatengine, Carnot theorem, corollaries of Carnot theorem, Absolute thermodynamic temperature scale.
**(b) Entropy:** Clausius theorem, the property of entropy, the inequality of Clausius, Entropy principle and its applications, Entropy change during different thermodynamic processes, entropygeneration in closed system and open system, first and second law combined.

**UNIT III: Exergy:** Available energy, availability and availabilityfunction of a closed system, availability and availability function of an open system, dead state, Helmholtzfunction, Gibbs functions, Irreversibility and Gouy-Stodola Theorem, Second law efficiency.

**UNIT IV: (a) Properties of gases:** Equation of state of a gas, Ideal gas, gas compression, deviation ofReal gas from ideal gas, Vander Waal's equation of state, correction for the intermolecular attractions,correction for finite size of molecules, evaluation of constants a and b, virial expansions, limitations ofthe van der Wall's equation, Reduced coordinates, compressibility factor, the law of corresponding States.
**(b) Properties of mixture of gases:** Mass Fraction, Mole fraction, Dalton's Law of partialpressure, Amagat-Leduc's law of additive Volumes, Properties of mixture of ideal non-reactive gases –gas constant, molecular weight, specific heat, internal energy, enthalpy and entropy.

# Chhattisgarh Swami Vivekanand Technical University,Bhilai

**UNIT V: Properties of Pure substances:** Thermodynamic properties of pure substances in solid, liquid and vapor phases, Phase Transformations, dryness fraction, Triple point, critical state, p-v, p-T, T-s,h-s diagrams, p-v-T surfaces, Properties and Processes in ideal vapor, use of steam tables and Mollierdiagram in determination of steam properties, energy interaction and Entropy calculations, measurementof steam quality.

**Tutorial from above units coveringpractical applications.**

***Text Books:***

1. Thermodynamics- An Engineering Approach – Cengal& Boles – McGraw Hill.
2. Engineering Thermodynamics – P.K. Nag – TMH.

***Reference Books:***

1. Fundamental of engineering thermodynamics- R.Yadav-CPH.
2. Thermal Science & Engineering – D.S. Kumar – S.K. Kataria.
3. Fundamental of Thermodynamic- Claus Borgnakke, Richard E. Sonntag- Wiley.
4. An Introduction to Thermodynamics-Y.V.C.Rao- University Press.
5. Engineering Thermodynamics-M.Achuthan- PHI.
6. Thermodynamics & Thermal Engineering – J. SelwinRajadurai– New Age.
7. Thermodynamics – C.P. Arora – TMH.
8. Thermodynamics – S.C. Gupta – Pearson.

**Course Outcomes**

**On successful completion of the course, the student will be able to:**

1. Apply basic concepts and first laws of thermodynamics to analyze thermodynamics system.
2. Apply the concepts of second law of thermodynamics and entropy to analyze thermodynamics system.
3. Apply the concepts of exergy to solve related problems.
4. Explain the equations of state and thermodynamic properties of real gases and calculate properties of mixture of ideal non- reactive gases.
5. Analyze processes involving pure substances.

# Chhattisgarh Swami Vivekanand Technical University, Bhilai

**Branch: Automobile Engineering** | **Semester: III**
**Subject: Mechanics of Solids** | **Code:B082313(037)**
**Total Theory Periods: 40** | **Total Tutorial Periods: 10**
**Class Tests: Two (Minimum)** | **Assignments: Two (Minimum)**
**ESE Duration: Three Hours** | **Maximum Marks: 100** | **Minimum Marks: 35**

**Course Objectives:**

- To gain a fundamental understanding of the concepts of stress and strain by analysis of solids and structures.
- To study engineering properties of materials, force-deformation and stress-strain relationship linear solids and structures
- To analyze; determinate and indeterminate axial members, torsional members and beams to determine axial forces, torque, shear forces, bending moments, slopes and deflection.
- To be able to perform structural analysis by hand computations and design axial and torsional members.
- To determine stress, strain, and deformation of bars, beams and springs.

| | |
|---|---|
| **Unit I** | **(a) Simple Stresses & Strains**-elasticity, Hooke's law, factor of safety, stress-strain diagram for ductile and brittle materials, Analysis-bar of varying sections, tapered bar, composite sections, bar of uniform strength, elongation of bar due to self-weight. Thermal stresses-composite bars.<br>**(b) Elastic constants**-Longitudinal strain, lateral strain, Poisson's ratio, volumetric strain, bulk modulus, relation between Young's modulus and bulk modulus, complementary shear stress, relation between modulus of elasticity and modulus of rigidity, stresses in the components subjected to multi-axial forces. |
| **Unit II** | **(a) S.F. and B.M. diagrams of beams**-Types of load, types of beams, SF and BM diagram for cantilever, simply supported and overhanging beams, Point of contra-flexure, relation between load, SF and BM.<br>**(b) Bending stresses in beams:** Pure bending, neutral axis, moment of resistance, bending stresses in symmetric sections, section modulus, bending equation, bending stress distribution, problems.<br>**Shear stress in beams:** shear stress at a section, shear stress distribution for rectangular, circular, I and T sections. |
| **Unit III** | **Deflection of transversally loaded beams:** Relation between slope, deflection and radius of curvature, determination of slope and deflection by Double integration method, Macaulay's method, Moment Area Method in simply supported, cantilever and overhanging beams. |
| **Unit IV** | **(a) Torsion of shafts-** Shear stress in circular shaft due to torsion, torque and power transmitted by solid, hollow & stepped circular shaft, polar modulus, strength of shafts and torsional rigidity, composite shaft, shafts in series, shafts in parallel, deflection of shafts fixed at both ends, combined bending and torsion.<br>**(b) Springs:** Types of spring, Closed Coil Helical Springs subjected to Axial Load, springs in series & parallel. |
| **Unit V** | **Transformation of stress and strain:** Principal stresses in two dimensional problems, Maximum shear stresses, Mohr's circle for plane stresses, strain in two dimension, Mohr's circle for strain in two dimension.<br>**Compound Stresses:** Combined axial, flexural and shear loads – eccentric loading under tension/compression - combined bending and twisting loads. |

**Text Books:**

1. Strength of Materials – S. Ramamrutham – Dhanpat Rai Publishing Company
2. Elements of Strength of Material – Timoshenko & Young- EWP press
3. Strength of Materials – Dr. Sadhu Singh – Khanna publication

**Reference Books:**

1. Strength of Materials – R.K. Rajput – Dhanpat Rai & Sons
2. Strength of Materials- Rattan – 2e McGraw Hill Education India,
3. Mechanics of Material- Gere and Timoshenko – CBS Publications
4. Mechanics of Solids – Beer & Johnson – Tata McGraw Hill Publications
5. Strength of material – Ryder – ELBS
6. Introduction to Solid Mechanics – I. H. Shames – PHI
7. Engineering Mechanics of Solids – E. P. Popov – PHI

**Course Outcomes:**

- Apply knowledge of mechanics of deformable body for understanding, formulating and solving engineering problems.
- Acquire knowledge and hands-on competence in applying the concepts mechanics of solid in the design and development of mechanical systems.
- Demonstrate creativeness in designing new systems components and processes in the field of engineering in general and mechanical engineering in particular.
- Identify, analysis, and solve mechanical engineering problems useful to the society.

# Chhattisgarh Swami Vivekanand Technical University,Bhilai

**Branch: Automobile Engineering** **Semester: III**
**Subject: Automotive Petrol Engines** **Code:B082311(082)**
**Total Theory Periods: 30** **Total Tutorial Periods: 10**
**Class Tests: Two (Minimum)** **Assignments: Two (Minimum)**
**ESE Duration: Three Hours** **Maximum Marks: 100** **Minimum Marks: 35**

**Course Objectives:**

- To study classifications of internal combustion engine.
- To understand how and why actual cycles deviate from air standard cycle and fuel-air cycle. To understand combustion in spark ignition engine.
- To impart knowledge about carburetion, gasoline injection.To impart knowledge about ignition,

**UNIT-I**

**Engine construction and operation :** Constructional details of four stroke petrol engine, working principle, air standard Otto cycle, actual indicator diagram, two stroke engine construction and operation, comparison of four stroke and two stroke engine operation, firing order and its significance. Port Timing, Valve TimingDiagram.

**UNIT -II**

**SI engine fuel system:** Carburettorworking principle, requirements of an automotive carburettor, starting, idling, acceleration and normal circuits of carburettors. Compensation, maximum power devices, constant choke and constant vacuum carburettors, fuel feed systems; mechanical and electrical fuel feed pumps. Petrol injection, MPFI.GDI System, Determination of air-fuel ratio and numerical problems on air-fuel ratio calculations.

**UNIT -III**

**Ignition system:** Types and working of battery coil and magneto ignit ion systems, relative merits and demerits, centrifugal and vacuum advance mechanisms. Types and construction of spark plugs, electronic ignition systems. Transistorized coil ignition system, capacitive discharge ignition system.

**UNIT -IV**

**Cooling and lubrication system:** Need for cooling system, Types of cooling system: air cooling system, liquid cooling system, forced circulation system, pressure cooling system. Lubrication system; mist, wet sump lubrication system, properties of lubricants.

**UNIT -V**

**Combustion and combustion chambers:** Combustion in SI engine; stages of combustion, flame propagation, rate of pressure rise, abnormal combustion, detonation, effect of engine variables on knock, knock rating. Combustion chambers; different types, factors controlling combustion chamber design.Engine Management Systems, Performance curves & valuation, Emission & Emission Control, Nano Problems, Heat releaseanalysis.

**TEXTBOOKS**


1. ACourseinInternalCombustionEngines–M.L.Mathur&R.P.Sharma–DhanpatRai&Sons
2. Internal CombustionEngine–V.Ganeshan–TMH


**REFERENCESBOOKS**


1. A Course in Internal CombustionEngine–V.M.Domkundwar–DhanpatRai&Sons
2. Internal Combustion Engine–R.Yadav–Central Publishing House,Allahabad
3. Fundamental of Internal Combustion Engine– PaulW.Gill,JamesH.Smith,EugeneJ.Ziurys–Oxfordand IBH PublishingCompany
4. Internal Combustion Engines–R.K.Rajput–LaxmiPublications


**Course outcomes:**

Demonstrate a basic understanding of S.I.Engine design, function and performance.
Acquire knowledge and hands-on competence in the design and development of mechanical systems.
Work effectively with engineering and science teams as well as with multidisciplinary designs.
Demonstrate an understanding of the relationships between the design of the internal combustion engine and environmental issues

# Chhattisgarh Swami Vivekanand Technical University,Bhilai

**Name of the program: Bachelor of Engineering**
**Branch: Automobile Engineering** **Semester: III**
**Subject: Two & Three Wheelers** **Code:B082315(082)**
**Total Theory Periods: 40** **Total Tutorial Periods: 10**
**Class Tests: Two (Minimum)** **Assignments: Two (Minimum)**
**ESE Duration: Three Hours** **Maximum Marks: 80** **Minimum Marks: 28**

**COURSE OBJECTIVE:**

- To study classifications of two stroke and four stroke engines.
- To understand chassis and its subsystem in two and three wheelers.To understand brakes, wheels and tyres of two and three wheelers.

**UNIT-I -**

**POWERUNIT**

Two stroke SI engine, four stroke SI engine; merits and demerits. Symmetrical and unsymmetrical port timing diagrams. Types of scavenging processes; merits and demerits, scavenging pumps.Rotary valve engine.Fuel systems.Lubrication systems. Magneto coil and battery coil spark ignition system, electronic ignition system. Starting system; Kick starter system.

**UNIT-II -**

**FUEL & IGNITION SYSTEMS**

Fuel System-Different circuits in two wheeler fuel systems, fuel injection system. Lubrication systems, Ignition Systems- Magneto coil and battery coil spark Ignition System, Electronic Ignition System

**UNIT-III –**

**CHASSIS AND SUB-SYSTEMS**

Main frame for two & three wheelers, its types, chassis and different drive system for two wheelers, Single, multiple plates and centrifugal clutches, Gear box and its various gear controls in two wheelers, Front and rear suspension system, Shock Absorbers, Panel meters and controls on handle bar..

**UNIT-IV –**

**BRAKES & WHEELS AND Tyres**

Drum Brakes & Disc brakes, Construction, Working and its Types, front and rear brake links layouts. Brake actuation mechanism. Spoked wheel, cast wheel, disc wheel - merits and demerits, Tyres and tubes.

**UNIT-V –**

**TWO & THREE WHEELER- CASE STUDY**

Case study of motor cycle,scooters and Mopeds- Autorickshaw, Pick up van, Delivery van and Trailer ,Maintenance & Fault trace recent developments.

**TEXTBOOKS:**

1. Motor Cycle Engineering- Irving. P.E. Temple Press Book,London–1992.
2. TheCycleMotor Manual-TemplePressLimited,London–1990

**REFERENCES:**

1. Encyclopedia of Motor cycling-20volumeMarshall,Cavensih,UK-1989
2. Maintenance and Repair Series- BrayantR.V,Vespa,S.Chand&Co.,NewDelhi-1986

Demonstrate a basic understanding of two and three wheeler .Engine design, function and performance.
Acquire knowledge and hands-on competence in the design and development of automobile systems.
Work effectively with engineering and science teams as well as with multidisciplinary designs.
Demonstrate an understanding of the relationships between the design of the internal combustion engine and environmental issues

# Chhattisgarh Swami Vivekanand Technical University,Bhilai

Name of program: **Bachelor of Technology**
Branch: **Automobile Engineering** Semester: **III**
Subject: **Material Testing Laboratory** **Code:B082321(037)**
Total Lab Periods: Batch Size:30
**Maximum Marks:40** **Minimum Marks:20**

**List of Experiments: (At least Ten experiments are to be performed by each student)**

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|---|---|
| 1 | To study the Universal Testing Machine |
| 2 | To perform the Tensile Test of Mild Steel on U.T.M and To Draw Stress–Strain Curve. |
| 3 | To determine strength of wood on U.T.M (i) Along the Grain (ii) Across the Grain. |
| 4 | To determine shear strength of Mild Steel on U.T.M. |
| 5 | To observe Flexural Behavior of Timber specimen and to determine its strength under transverse loading on U.T.M. |
| 6 | To study the Impact Testing Machine and test specimen of Izod and Charpy. |
| 7 | To determine Izod and Charpy Value of the given mild steel specimen |
| 8 | To study the Fatigue Testing Machine and to discuss the procedure to find out endurance limit of given material. |
| 9 | To study the Spring Testing Machine. |
| 10 | To determine modulus of rigidity for the material of open and closed Coiled Helical Spring Subjected to Axial Load by spring testing machine. |
| 11 | To study the Torsion Testing Machine |
| 12 | To determine ultimate shear stress and modulus of rigidity under Torsion. |
| 13 | To study the Cupping Test Machine and to determine Erichsen value of Mild Steel sheet. |
| 14 | To study the Rockwell Hardness Testing Machine and to determine the Rockwell Hardness of the given material. |
| 15 | To study the Brinell Hardness Machine and to determine the Brinell hardness of the given material. |
| 16 | To study the Vickers Hardness Machine and to conduct a hardness test on the machine. |
| 17 | To study Column testing machine and to conduct Buckling Test of column. |

**Equipment/Machines/Instruments/Tools/Software Required:**

| | |
|---|---|
| Universal Testing Machine | Cupping Testing Machine |
| Impact Testing Machine | Rockwell Hardness Testing Machine |
| Fatigue Testing Machine | Brinell Hardness Machine |
| Spring Testing Machine | Vickers Hardness Machine |
| Torsion Testing Machine | Column Testing Machine |

# Chhattisgarh Swami Vivekanand Technical University,Bhilai

Name of program: **Bachelor of Technology**
Branch: **Automobile Engineering** Semester: **III**
Subject: **Engineering Thermodynamics Lab** **Code: B082322(037)**
Total Lab Periods: **24** Batch Size - **30**
**Maximum Marks: 40** **Minimum Marks: 20**

**Course Objective:**

1. To physically engage students to real world thermal equipments through active experimentation to develop deeper understanding of theoretical concepts.
2. To impart an understanding of boiler classification, boiler mountings, accessories, boiler performance parameters and draught.
3. To study about of steam engine, steam turbines.
4. To study about surface and jet condenser.
5. To study about reciprocating air compressor.

***List of Experiments:*** **(At least Ten experiments are to be performed by each student)**

1. To study the rise in temperature of liquid due to external work.
2. Effect of reduction in temperature in a steam pressure vessel.
3. To study the expansion process using throttling devices.
4. To study the effect of mixing of two/three fluid streams having different flow rates and temperatures.
5. To study the different thermodynamic working fluid e.g. air, steam.
6. To study boiler, boiler classification and performance parameters of boiler.
7. To study draught, classification of draught and related parameters.
8. To study the Cochran boiler and its accessories and mountings.
9. To study the Lancashire boiler and its accessories and mountings.
10. To study the Babcock Wilcox boiler and its accessories and mountings.
11. To study a simple steam engine.
12. To study a compound steam engine.
13. Performance and testing of surface steam condenser.
14. Performance and testing of steam jet condenser.
15. Study of steam turbines.
16. Study of reciprocating air compressor.

**Note: Students are required to submit a mini project at the time of final assessment.**

**Equipment/Machines/Instruments/Tools/Software Required:**

- Insulated agitated vessel.
- Steam pressure vessel with arrangement for external cooling.
- Compressed air tank with expansion device.

- Arrangement of mixing of two/three fluid streams.
- Boiler mountings
- Boiler accessories
- Cochran boiler
- Lancashire boiler
- Babcock and Wilcox boiler
- Simple Steam engine
- Compound steam engine
- Steam Turbines
- Surface steam condenser
- Jet steam condenser
- Reciprocating air compressor

**Course Outcomes**

**On successful completion of the course, the student will be able to:**

1. Demonstrate an ability to explain basic knowledge of laws of thermodynamics and its verification through experimentation.
2. Describe construction and working of various types of boilers, boiler mountings, accessories, performance parameters and draught.
3. Describe various types of steam engine, steam turbines.
4. Describe surface and jet condenser.
5. Describe reciprocating air compressor.

# Chhattisgarh Swami Vivekanand Technical University,Bhilai

**Name of the program: Bachelor of Engineering**
**Branch:AutomobileEngineering** **Semester:III**
**Subject: Two & ThreeWheelersLab** **Code:B082323(082)**
**Total LabPeriods:24** **Batch Size:30**
**MaximumMarks:40** **Minimum Marks:20**

***List of Experiments:***

1. Performance test of a two wheeler using chassisdynamometer.
2. Performance test on shockabsorber
3. Performance test on coilspring.
4. Two wheeler chaintest
5. Brake and Clutch adjustment as perspecification.
6. Dismantling and assembling of two wheeler gear box and finding gearratios
7. Dismantling and assembling of three wheeler box and finding gearratios
8. Three wheeler brake and clutch playadjustment
9. Dismantling and assembling of three wheeler steeringsystem.
10. Study of three wheeler chassis frame and power transmissionsystem.