Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program: **Bachelor of Technology**	Semester: **IV**
Branch: **Mechanical Engineering**	Code: B037411(037)
Subject: **Applied Thermodynamics**	Total Tutorial Periods: **01**
Total Theory Periods: **02**	Maximum Marks**: 100**
Class Tests: **Two (Minimum)**	Minimum Marks: **35**
Assignments: **Two (Minimum)**	ESE Duration: **Three Hours**

Course Objectives: The objective of this course is to develop student's ability to apply principles of thermodynamics to analyze the basic energy conversion systems of power generation, compression, condensation and system with compressible flow.	

UNIT- I	**Gas power cycles:** An overview of reciprocating engine, Air standard cycle, Otto cycle, Diesel cycle, Dual cycle-Description and representation on P-V and T-S diagram, Thermal Efficiency, Mean Effective Pressures, comparison of cycles. An overview (only p-v and T-s diagram) of Sterling, Ericson, Atkinson, Lenoir cycle.
UNIT-II	**Reciprocating Air Compressors:** Classification of air compressors, working of single acting single cylinder reciprocating compressor, single acting reciprocating compressor without clearance, single acting reciprocating compressor with clearance-equation of work, volumetric efficiency. Multistage reciprocating air compressors, advantage of multistage compression, two stage air compressor-minimum work, Indicator diagram, mean effective pressure and indicated power, compressor power , efficiencies, shaft power of the compressor, advantages and limitations of reciprocating compressors.
UNIT- III	**Vapor Power Cycle:** Simple steam power cycle, Rankine cycle; p-v, T-s and h-s diagrams, efficiency, steam rate, heat rate, comparison of Rankine and Carnot cycles, mean temperature of heat addition, reheat cycle, ideal regenerative cycle, practical regenerative cycle, Feed Water Heaters (FWH)- open and closed FWH, characteristics of ideal working fluids, binary vapor cycle.
UNIT- IV	**Steam Condensers:** The function of condenser, Element of a water cooled condensing unit, types of condenser, advantages and disadvantages of various types of condenser, condenser vacuum, mass of circulating water required, source of air its effects and removal, vacuum efficiency, condenser efficiency **Cooling ponds and cooling tower:** Cooling pond, cooling towers, classification and working principles.
UNIT-V	**Thermodynamics of Compressible Fluids:** Velocity of pressure waves in a fluid, Mach number, isentropic stagnation state, stagnation enthalpy, temperature, pressure, density, one dimensional steady isentropic flow, area velocity relationship, critical properties-choking in isentropic flow, dimensionless velocity, Effect of back pressure on the performance of nozzle flow. Flow of steam through nozzle, throat area for maximum discharge, supersaturated Flow in nozzle.

Text Books:	
1.	Thermodynamics- An Engineering Approach – Cen gal & Boles – McGraw Hill, Delhi
2.	Engineering Thermodynamics – P.K. Nag – TMH Publishers

Reference Books:	
1.	Fundamental of engineering thermodynamics- R.Yadav, CPH, Allahabad
2.	Thermal Science & Engineering – D.S. Kumar – S.K. Kataria & Sons
3.	Fundamental of Thermodynamic- Claus Borgnakke, Richard E. Sonntag, Wiley, Delhi
4.	An Introduction to Thermodynamics-Y.V.C.Rao, UniversityPress, Hyderabad
5.	Thermodynamics & Thermal Engineering – J. Selwin Rajadurai – New Age International Publishers
6.	Thermodynamics – C.P. Arora – TMH, Delhi
7.	Thermodynamics – S.C. Gupta – Pearson Education, Delhi

Course Outcomes:	
On successful completion of the course, the student will be able to:	
1.	Analyze and evaluate gas power cycles.
2.	Analyze reciprocating air compressors.
3.	Analyze vapour power cycle.
4.	Analyze steam condenser and discuss working principle of cooling pond and cooling towers.
5.	Analyze thermodynamic system with compressible fluid.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program: **Bachelor of Technology**	Semester: **IV**
Branch: **Mechanical Engineering**	Code: B037412(037)
Subject: **Fluid Mechanics**	Total Tutorial Periods: **01**
Total Theory Periods: **03**	Maximum Marks**: 100**
Class Tests: **Two (Minimum)**	Minimum Marks: **35**
Assignments: **Two (Minimum)**	ESE Duration: **Three Hours**

Course Objectives:
The objective of the course is to develop an understanding of the behavior of fluids at rest or in motion and the subsequent effects of the fluids on the boundaries as the mechanical engineers has to deal with fluids in various applications. This enables students to apply the analytical tools to solve different types of problems related to fluid & fluid flow.

UNIT- I	**Properties of fluid:** Fluid, ideal and real fluid, properties of fluid : mass density, weight density, specific volume, specific gravity, viscosity, surface tension, capillarity, vapour pressure, compressibility and bulk modulus. Newtonian and non-Newtonian fluids **Fluid Statics:** Pressure, Pascal's law, Hydrostatic law, Manometry, Hydrostatic force on submerged plane and curved surface, Buoyancy and Flotation.
UNIT-II	**Fluid Kinematics:** Description of fluid motion, Langragian and Eulerian approach, Type of fluid flow, Type of flow lines-path line, streak line, stream line, stream tube. Continuity equation, acceleration of a fluid particle, motion of fluid particle along curved path, Normal and tangential acceleration, Rotational flow, Rotation and Vorticity, circulation, stream and potential function, flow net ,its characteristics and utilities. Liquid in relative equilibrium.
UNIT- III	**Fluid Dynamics:** Euler's Equation, Bernoulli's equation and its practical application, Venturimeter, Orifice meter, Nozzle, Pitot tube.Impulse momentum equation, Momentum of Momentum equation, Kinetic energy and Momentum correction factor, Vortex motion, Radial flow.
UNIT- IV	**Laminar Flow:** Reynold's experiment, flow of viscous fluids in circular pipe, shear stress and pressure gradient relationship, Velocity distribution, Hagen-Poiseuille Equation, flow of viscous fluids between two parallel plates (Coutte flow) shear stress and pressure Gradient relationship, Velocity distribution, Drop of pressure head. **Turbulent flow:** Effect of turbulence, Expression for loss of head due to friction in pipes (Darcy-Weisbach equation), Expression for co-efficient of friction in terms of shear stress. **Flow through pipe:** Loss of energy in pipes, Hydraulic gradient and total energy line, pipe in series and parallel, equivalent pipe power transmission through pipe, water hammer in pipes.
UNIT-V	**Dimensional Analysis:** Methods of dimensional analysis, Rayleigh's method, Buckingham's theorem, Limitations. **Model analysis:** Dimensionless number and their significance, model laws, Reynolod's model law, Fraude's model law, Euler's model law, Weber's model law, Mach's model law, Type of models, scale effect in model, limitation of hydraulic similitude.

Text Books:	
1.	Fluid Mechanics and Fluid Power Engineering – D.S. Kumar– Kataria & Sons – New Delhi
2.	A text of Fluid Mechanics – R. K. Rajput – S. Chand & Company Ltd., Delhi

Reference Books:	
1.	Fluid Mechanics & Hydraulics Machines-R.K.Bansal-Laxmi Publications.,Delhi
2.	Engineering Fluid Mechanics –K.L. Kumar, Eurasia Publication House, Delhi
3.	Mechanics of Fluid – B.S. Massey – English Language Book Society (U.K.)
4.	Fluid Mechanics- Yunush A. Cengel, John M. Cimbala- TMH,Delhi
5.	Introduction to Fluid Mechanics and Fluid Machines – S.K. Som and G. Biswas- TMH ,Delhi
6.	Hydraulics and Fluid Mechanics Including Hydraulic Machine- PN Modi,& SM Seth-Standard, Delhi
7.	Theory and Application of Fluid Mechanics- K.Subramanya-TMH Delhi

Course Outcomes	
1.	Explain fluid properties and basic principles of fluid statics and analyze the problem related to manometry, forces on submerge plane, buoyancy and flotation.
2.	Explain basic principles of fluid kinematics and analyze related practical problem.
3.	Explain basic principles of fluid dynamics and analyze related practical problem.
4.	Derive relationships for various flow characteristics of laminar flow, turbulent flow and energy losses in pipe flow and apply to analyze related practical problems.
5.	Apply dimensional analysis to derive a relationship among connected variables and apply model laws to predict the behavior of the prototype in given circumstances.

Chhattisgarh Swami Vivekanand Technical University, Bhilai	
Name of program: **Bachelor of Technology**	Semester: **IV**
Branch: **Mechanical Engineering**	Code: B037413(037)
Subject: **Strength of Materials**	Total Tutorial Periods: **01**
Total Theory Periods: **02**	Maximum Marks: **100**
Class Tests: **Two (Minimum)**	Minimum Marks: **35**
Assignments: **Two (Minimum)**	ESE Duration: **Three Hours**

Course Objectives:
This course is designed to understand the basic concepts of stress, strain and their variations under different types of loading. It includes analysis of beam, shaft and spring for bending moment, shear force, shear stress, slope and deflection under different loading and support conditions.

UNIT- I	**(a) Simple stress & strain**: 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. **(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. **(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. **(c) 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. **(b) Springs:** Types of spring, Closed Coil Helical Springs subjected to Axial Load, springs in series & parallel.
UNIT-V	**(A) Principal stresses and strain:** Transformation of plane stresses, Principal stresses, Maximum shear stresses, Mohr's circle for plane stresses, Plain strain and its Mohr's circle representation, Principal strains, Maximum shear strain. **(B) Combined Loading:** Components subjected to bending, torsion & axial loads.

Text Books:	
1.	Elements of Strength of Material – Timoshenko & Young- EWP press
2.	Strength of Materials – Dr. Sadhu Singh – Khanna publication
3.	Mechanics of Solids – Beer & Johnson, Tata McGraw Hill Publications

Reference Books:	
1.	Strength of Materials – R.K. Rajput – Dhanpat Rai & Sons
2.	Mechanics of Material-Gere and Timoshenko CBS Publications
3.	Strength of Materials- R. Subramanian, Oxford University Press
4.	Strength of material – Ryder–ELBS
5.	Introduction to Solid Mechanics – I.H.Shames–PHI
6.	Engineering Mechanics of Solids – E.P. Popov – PHI

Course Outcomes:	
1.	Apply the concept of stress and strain to analyze various types of structures.
2.	Determine the distribution of shear force, bending moment and transverse shear stress along the loaded beam.
3.	Determine the deflections and slope of loaded flexural members. .
4.	Analyze shaft and springs under torsional load.
5.	Analyze various structural elements subjected to combined stresses/combined loads.

Chhattisgarh Swami Vivekanand Technical University, Bhilai	
Name of program: **Bachelor of Technology**	Semester: **IV**
Branch: **Mechanical Engineering**	Code: B037414(037)
Subject: **Manufacturing Process**	Total Tutorial Periods: **01**
Total Theory Periods: **02**	Maximum Marks: **100**
Class Tests: **Two (Minimum)**	Minimum Marks: **35**
Assignments: **Two (Minimum)**	ESE Duration: **Three Hours**

Course Objectives:
This course is designed to provide students with an overview of a wide variety of manufacturing processes for processing of engineering materials. Student will learn principles, operations and capabilities of various moulding, metal casting, metal joining and metal cutting processes.

UNIT- I	**Introduction to Manufacturing Processes:** Importance of Manufacturing Processes, classification, technological definitions. **Metal Casting (Foundry): Introduction:** Basic Principle, Advantages and Limitations, Applications. **Pattern Making**: Pattern materials, allowances, types of pattern, color code scheme **Mould Making**: Green and dry sand casting process, types of sand, molding sand and its properties, molding sand composition and applications. **Elements of mould**: Cores; Use, core material, types of cores, advantages and limitations, core prints, chaplets, Gating and Risering System, Sand casting defects: appearance, causes & remedies. **Special Molding Processes**: Carbon dioxide molding process, investment casting process, Die casting process, shell molding process, continuous casting process, centrifugal casting processes.
UNIT-II	**Welding – I: Introduction:** Principle, classification based on application of filler material & without filler material, source of energy, fusing and pressure welding processes, application of welding processes. **Arc welding**: Principle, power source and equipments, welding electrodes- types' composition & specification, Metal Arc welding (MAW), flux Shielded Metal Arc Welding (FSMAW), Inert Gas Welding (TIG & MIG) Submerged Arc Welding (SAW) and Atomic Hydrogen Welding processes. (AHW). **Gas Welding**: Principle, Oxy-Acetylene welding, Reaction in Gas welding, Flame characteristics, Gas torch construction & working, forward and backward welding.
UNIT- III	**Welding – II: Resistance Welding:** General, principle of heat generation in resistance welding, application of resistance welding processes. Process details and working principle of spot, seam and projection welding, electrode materials, shapes of electrodes, electrode cooling, selection of welding currents, voltages. **Special type of welding**: Friction welding, Explosive welding, Thermit welding, Laser welding, Electron beam welding, Electroslag welding, Ultrasonic welding; principle, equipments, operations. **Soldering, Brazing & Braze welding, Welding Defects**
UNIT- IV	**Machine Tools: Lathe:** Principle of operation, basic parts of a lathe, types – speed lathe, engine, bench, tool room, capstan, turret, automatic, specification, construction, operations-facing, turning, knurling, taper turning, thread cutting, drilling, boring, reaming, work holding devices & tools, mechanism and attachments for various operations. **Shaper**: Principle of operation, parts, types horizontal, vertical, universal, Operations – horizontal cutting, vertical cutting, angular cutting, irregular cutting, specification, Quick return Mechanisms. Table feed mechanism, work holding devices. **Planner:** Principle of operation, parts, types – double housing, open side, pit type, plate type, divided table. Specification, types of drives.
UNIT-V	**Milling:** Principle of operation, parts, specification, types- horizontal, vertical, universal, milling operations – plain, face, slotting, gear cutting mechanisms and attachments for milling, indexing-simple, compound and differential. **Broaching:** Principle of operation, parts, types of broaches- horizontal, vertical, pull, surface-internal and external broaching machines, nomenclature, of broach.

	Drilling: Principle of operation, parts, drill nomenclature, types of drilling machines, other operations like counter boring, counter sinking, spot facing etc. **Reaming**: Principle of operation, parts, description of reamers, and type of reaming operations. **Boring:** Principle of operation, parts, types of boring machines, boring operations, boring tools

Text Books:	
1.	Manufacturing Technology (Vol. – I & II) – P.N. Rao – Tata McGraw Hill Pub. Company, New Delhi.
2.	A Text Book of Production Technology (Manufacturing Processes) – P.C. Sharma – S. Chand and Company Ltd., New Delhi.

Reference Books:	
1.	Manufacturing Science – A. Ghosh & A.K. Mallik – East West Press Pvt. Ltd., New Delhi
2.	Manufacturing Engineering and Technology – S. Kalpakjian & S.R. Schmid – Addision Wesley Longman, New Delhi
3.	Production Technology – R. K. Jain – Khanna Publishers, New Delhi
4.	A Text Book of Production Technology (Vol. I & II) – O.P. Khanna – Dhanpat Rai & Sons, New Delhi.

Course Outcomes:	
1.	Describe various metal casting and allied processes.
2.	Describe various arc and gas welding processes.
3.	Describe resistance welding, other special type of welding , soldering, brazing and braze welding
4.	Describe construction, working and various machining operations of lathe, shaper and planer
5.	Describe construction, working and various machining operations of milling, broaching, drilling rimming and boring machine

Chhattisgarh Swami Vivekanand Technical University, Bhilai	
Name of program: **Bachelor of Technology**	Semester: **IV**
Branch: **Mechanical Engineering**	Code: B037415(037)
Subject: **Kinematics of Machine**	Total Tutorial Periods: **01**
Total Theory Periods: **03**	Maximum Marks: **100**
Class Tests: **Two (Minimum)**	Minimum Marks: **35**
Assignments: **Two (Minimum)**	ESE Duration: **Three Hours**

Course Objectives:
Study of kinematics is concerned with understanding of relationships between the geometry and the motions of the parts of a machine. The overall objective of this course is to learn how to analyze the motions of mechanisms, design mechanisms to give desired motions. This course includes graphical and analytical analysis of position, velocity and acceleration, drawing the profile of cams and its analysis, gear kinematics with gear train calculations, theory of friction, belt drive, brakes & dynamometer.

UNIT- I	**Relative velocity:** Elements, pairs, Mechanism, Four bar chain and its inversion, Velocity diagrams, Relative velocity method, Instantaneous centre method.
UNIT-II	**Relative Acceleration:** Synthesis of mechanism, Pantograph, Lower pair mechanism, Relative acceleration diagram, Kliens construction, Coroillis component of acceleration.
UNIT- III	**Cams:** Classification of cams and followers, Nomenclature of a radial cam, Description of follower movement, Displacement diagrams, Uniform and modified uniform motion, Simple harmonic motion, Uniform acceleration motion and its modifications, Cycloidal motion, Synthesis of cam profile by graphical approach, Considerations of pressure angle. Cams with specified contours: Circular arc cam & tangent cam.
UNIT- IV	**Gear:** Types of gears, Gear terminology, Law of gearing, Gear tooth forms, Involute and Cycloid tooth profile, Interference and Undercutting of Involutes teeth, Minimum number of teeth on pinion to avoid interference. **Gear trains:** Simple, Compound, Reverted, and Epicyclical gear trains, computation of velocity ratio in gear trains by different methods.
UNIT-V	**(a) Friction:** Applications of friction, Pivot and collar friction, Thrust bearing. **(b) Belt-Drives**: Ratio of tensions for flat belt & V-belt, Centrifugal tension, condition for maximum power transmission. **(c) Brakes and dynamometer:** Simple block and shoe brake, Band brake, Band and block brake, and internal expanding shoe brake, Absorption dynamometer, Transmission dynamometer.

Text Books:	
1.	Theory of Machine – S. S. Ratan-Tata McGraw Hill.
2.	The Theory of Machine – Thomas Beven – CBS Publishers.

Reference Books:	
1.	Theory of mechanism and machine – A. Ghosh, A.K. Mallik –EWP Press.
2.	Theory of Machine – Shigley, JE- Oxford University Press
3.	Theory of Machine- Jagdish Lal- Metropolitan Book Co. Pvt. Ltd.
4.	Theory of machine – J.E. Singh – McGraw Hill.

Course Outcomes:	
1.	Describe the concepts of machines, mechanisms and related terminologies and analyze planar mechanism for displacement and velocity.
2.	Analyze planar mechanism for acceleration.
3.	Analyze cam-follower mechanism.
4.	Analyze gears and gear train.
5.	Analyze bearings, belt-drive, brakes and dynamometer.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program: **Bachelor of Technology**	
Branch: **Mechanical Engineering**	Semester: **IV**
Subject: **Fluid Mechanics Lab**	Code: B037421(037)
Total Lab Periods: **48**	Batch Size – **30**
Maximum Marks**: 40**	Minimum Marks: **20**

Course Objectives:
The Fluid mechanics lab runs closely with the lectures in such a way that experiments support the text covered in the class room. The objective of this course is to compare the results of analytical models introduced in lecture to the actual behavior of real fluid flows.

List of Experiments: (At least Ten experiments are to be performed by each student)	
1.	To determine the meta-centric height of a ship model.
2.	To verify Bernoulli's Theorem.
3.	To verify Impulse Momentum Principle.
4.	To calibrate a Venturimeter and study the variation of coefficient of discharge.
5.	To calibrate an orifice-meter.
6.	Experimental determination of critical velocity in pipe.
7.	To determine of head loss in various pipe fittings.
8.	Flow measurement using Pitot tube.
9.	To study the transition from laminar to turbulent flow and to determine the lower critical Reynold's number.
10.	To determine the hydraulic coefficients (C_c, C_d and C_v) of an orifice.
11.	To determine the coefficient of discharge of a mouth piece.
12.	To obtain the surface profile and the total head distribution of a forced vortex.
13.	To study the velocity distribution in pipe and to compute the discharge by integrating velocity profile.
14.	To study the variation of friction factor for pipe flow.
15.	To determine the roughness coefficient of an open channel.

List of Equipment/Instruments/Machines/Software Required:
•   Apparatus for determination of metacentric height
•   Bernoulli's apparatus
•   Impact of jet apparatus
•   Venturimeter
•   Orifice meter
•   Pipe friction apparatus
•   Orifice apparatus
•   Mouth Piece apparatus with the provision for determination of hydraulic coefficient C_c, C_d & C_v
•   Vortex flow apparatus
•   Apparatus of head loss in various pipe fittings.
•   Reynold's apparatus
•   Complete setup for flow measurement using Pitot tube

Course Outcomes:	
On successful completion of the course, the student will be able to:	
1.	Demonstrate practical understanding of principles of buoyancy and flotation and determine meta-centric height.
2.	Verify impulse momentum principle
3.	Demonstrate practical understanding of the various terms in Bernoulli's equation and verify Bernoulli's theorem.
4.	Calibrate flow measurement devices
5.	Demonstrate practical understanding of Major and Minor Losses in pipe flow.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program: **Bachelor of Technology**	
Branch: **Mechanical Engineering**	Semester: **IV**
Subject: **Material Testing Lab**	Code: B037422(037)
Total Lab Periods: **48**	Batch Size – **30**
Maximum Marks**: 40**	Minimum Marks: **20**

Course Objectives:
This course provides students opportunities to become familiar with standard mechanical testing methods and fundamental properties of engineering materials, and to develop report writing proficiency.

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

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

1.	Analyze mechanical properties of various engineering materials under a specific types of load in universal testing machine.
2.	Analyze mechanical properties of engineering materials under impact loading.
3.	Analyze mechanical properties of specimen under torsion (Torsion Testing Machine, Spring Testing Machine)
4.	Determine hardness of given material.
5.	Analyze mechanical properties of specimen under fatigue, deep drawing and buckling load.

Chhattisgarh Swami Vivekanand Technical University, Bhilai	
Name of program: **Bachelor of Technology**	
Branch: **Mechanical Engineering**	Semester: **IV**
Subject: **Manufacturing Science Lab**	Code: B037423(037)
Total Lab Periods: **48**	Batch Size – **30**
Maximum Marks**: 40**	Minimum Marks: **20**

Course Objectives: Manufacturing is the backbone of any industrialized nation. The objective of the course is to provide an overview of the different manufacturing processes which are commonly employed in the industry to fabricate component using different materials.

List of Experiments: *(At least Ten experiments are to be performed by each student)*	
Foundry	
1.	Moulding of a multi-piece pattern by green sand moulding.
2.	Making a mould (with core) and casting.
Machine Tool	
3.	Taper turning in a Lathe
4.	Thread cutting in Lathe
5.	Slot cutting in Shaper
6.	Gear cutting in milling machine using indexing head.
7.	Alignment testing of Lathe
8.	Drilling, boring and reaming of a hole.
Cutting Tool	
9.	Study of turning tool of Lathe (Tool signature)
10.	Study of twist drill
Welding	
11.	Joining MS plates by arc welding (SMAW,MIG)
12.	Joining metal sheet by resistance welding
13.	Joining metal by soldering/brazing
Inspection and Testing	
14.	Inspection of casting defect and welding defects
15.	Non destructive testing of casting and welding defects

Equipment/Machines/Instruments/Tools/Software Required:	
1.	Moulding equipment
2.	Melting facility
3.	Lathe
4.	Shaper
5.	Drilling Machine
6.	Milling Machine
7.	Reamers
8.	Arc welding equipments
9.	Soldering /Brazing equipments
10.	Non destructive testing equipments

Course Outcomes:	
On successful completion of the course, the student will be able to:	
1.	Demonstrate the use of green sand molding process for casting.
2.	Demonstrate the use of various machine tools for important machining operations.
3.	Explain the tool geometry of single point cutting tool and twist drill.
4.	Explain the practicability of various metal joining processes like arc welding, resistance welding, soldering and brazing.
5.	Obtain practical skills in inspection and testing of casting and welding defects.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program: **Bachelor of Technology**	
Branch: **Mechanical Engineering**	Semester: **IV**
Subject: **Virtual Lab**	Code: B037424(037)
Total Lab Periods: **48**	Batch Size – **30**
Maximum Marks**: 40**	Minimum Marks: **20**

Course objective:

The objective of this course is to inculcate a habit of self learning in our students through virtual lab. Virtual Labs is a project initiated by the Ministry of Human Resource Development, Government of India, under the National Mission on Education through Information and Communication Technology. Virtual lab provides remote experimentation which furnishes basic leaning skill, and built advanced concepts as well. It provide complete Learning Management System around the Virtual Labs where the students can avail the various tools for learning, including additional web-resources, video-lectures, animated demonstrations and self evaluation.

	List of Experiments		
Sl.	**Name of Virtual Lab**	**Website link**	
A.	**Strength of materials Lab**	**http://sm-nitk.vlabs.ac.in/**	**(Any 03)**
	1. To study the mechanical properties of Mild Steel and Cast iron specimen under tension load and compression load.		
	2. To study the mechanical properties of mild steel under torsion and bending.		
	3. To determine experimentally, the ultimate shear strength of timber.		
	4. To find the Rockwell and Brinell hardness number of mild steel, cast iron, brass, aluminum and spring steel.		
	5. To find the impact resistance of mild steel and cast iron using Izod and Charpy test.		
B.	**Mechanics of Machine lab/ Mechanisms Lab**	**http://mm-nitk.vlabs.ac.in/** **http://vlabs.iitkgp.ernet.in/mr/**	**(Any 03)**
	1. To study Kinematic analysis of Slider cranks mechanism.		
	2. To study Kinematic analysis of Elliptical Trammel.		
	3. To study Kinematic analysis of Crank and Slotted Mechanism		
	4. To study Oldham Coupling Mechanism.		
	5. To study quick return mechanism.		
C.	**Virtual laboratory Experience in Fluid and Thermal Sciences**	**https://mfts-iitg.vlabs.ac.in/**	**(Any 03)**
	1. To perform conduction analysis of Single Material Slab and cylinder.		
	2. To perform conduction analysis of Double Material Slab.		
	3. To perform conduction analysis of cylinder.		
	4. To determine the overall heat transfer coefficient (U) in the parallel flow heat exchanger.		
	5. To determine the overall heat transfer coefficient (U) in the counter flow heat exchanger.		
D.	**Micromachining laboratory**	**http://mm-coep.vlabs.ac.in/**	**(Any 02)**
	1. To study the Wire Electrical Discharge Machining process.		
	2. To study the Laser Hardening process.		
	3. To study the electrochemical machining Process.		

E.	**Fabrication Laboratory (FAB LAB)**	http://fab-coep.vlabs.ac.in/Introduction.html	**(Any 01)**
	1. Study of Molding and Casting of complex shapes using Polyurethane rubber mold compounds. 2. To understand the process parameters of 3D scanning to generate digitized data from physical model.		

Equipment/Machines/Instruments/Tools/Software Required:	
1.	Computer system with good connectivity to Internet, any specific software is not required.

Note:	
1.	Refer Virtual Labs website which is an initiative of ministry of education under the national mission on education through ICT to conduct virtual lab. Link: https://www.vlab.co.in/
2.	It is advised to visit https://www.vlab.co.in/broad-area-mechanical-engineering frequently for any update and new experiments on the listed subjects.

Course Outcomes:	
On successful completion of the course, the student will be able to:	
1.	Perform experiments of material testing laboratory through virtual simulator.
2.	Analyze different type of mechanism through virtual simulator.
3.	Analyze various heat transfer parameter in virtual laboratory
4.	Describe EDM, Laser cutting, ECM after learning the process through micromachining laboratory
5.	Describe casting/ 3D scanning after learning the process through fabrication laboratory.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program: **Bachelor of Technology**

Branch: **Common to All Branches**   Semester: **IV**

Subject: **Indian Culture and Constitution of India**   Code: B000406(046)

Total Theory Periods: **2/Week**   Total Tutorial Periods: **NIL**

Assignments: **Two (Minimum)**   Total Marks in ESE: **NIL**   Marks in TA: **10**

Objective: The Constitution is the supreme law and it helps to maintain **integrity** in the society and to promote unity among the citizens to build a great nation. The main objective of the Indian Constitution is to promote harmony throughout the nation.

Course Objectives

Upon completion of this course, the student shall be able

- To understand Meaning and concepts of Traditional and Modern of Culture
- To understand Sources of the Study of Indian Culture
- To Enable the student to understand the history and importance of constitution
- To understand philosophy of fundamental rights and duties
- To understand the powers and functions of executive, legislature and judiciary
- To understand the powers and functions of state government
- To understand the recent trends in Indian constitutional and election commission of India.

To understand the central and state relation, financial and administrative.

UNIT-I

Meaning and concepts of Culture: Traditional and Modern concepts of Culture-Notions of Culture in textual tradition, anthropological, archaeological and sociological understanding of the term culture. Elements of Culture, concept of Indianness and value system. Relation between culture and civilization. Historiography and approaches to the study of Indian Culture– Stereotypes, Objectivity and Bias, Imperialist, Nationalist, Marxist and Subaltern. Heritage of India and world's debt to Indian Culture.

UNIT–II

Sources of the Study of Indian Culture: Archaeological: cultural remains, Monuments, Numismatics, Epigraphy; Literary sources and Oral traditions; Foreign Accounts; Archival sources.

UNIT–III

History of Indian Constitution Constitutional History, Preamble salient features, citizenship, Method of Amendment and Recent Amendments. **Rights and Duties** Fundamental Rights and Directive Principles of State Policy. Fundamental Duties. Difference between Fundamental Rights and Directive Principles of State Policy

Union Government a) President-powers and functions. Vice president powers and functions, Prime Minister and council of ministers powers and functions. b) Parliament- Loksabha, Rajyasabha- composition powers and functions.

c) Judiciary (Supreme Court) composition powers and functions Judicial Activism

State Government a) Governor: powers and functions b) Chief minister: powers and functions c) State Legislative Assembly and Legislative Council- composition powers and functions. d) High Court : composition powers and functions

Recent Trends in Indian Constitutional a) Basic structure of Indian Constitution. b) Electoral Reforms c) Panchayati Raj system in India.

Books of Reference

1. Dr. P. K. Agrawal Indian Culture, Art and Heritage,

2. P. Raghunadha Rao Indian Heritage and Culture

3. M.V.Pylee, An Introduction to the Constitution of India,NewDelhi,Vikas,2005.

4. Subhash C.Kashyap, Our Constitution: An Introduction to India's Constitution and constitutional Law, New Delhi, National Book Trust, 2000.

5. Durga Das Basu, Introduction to the Constitution of India ,NewDelhi,Prentice Hall of India,2001.

6. D.C.Gupta, Indian Government and Politics,VIII Edition,New Delhi, Vikas, 1994.

7. V.D.Mahajan, Constitutional Development and National Movement inIndia, New Delhi, S. Chand and Co., latest edition.