CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY

छत्तीसगढ़ स्वामी विवेकानंद तकनीकी विश्वविद्यालय

SCHEME OF TEACHING AND EXAMINATION

B.E. IV SEMESTER-AUTOMOBILE ENGINEERING

S. No.	Board of Study	Sub. Code	SUBJECT	PERIODS PER WEEK			SCHEME OF EXAM Theory/Practical			Total Marks	Credit L+(T+P/2	ESE Duration
				L	T	P	ESE	CT	TA			
1.	Mech. Engg	**337451(37)**	Fluid Mechanics	4	1	-	80	20	20	120	5	3 Hours
2.	Mech. Engg	**382452(37)**	Automotive Diesel Engines	4	1	-	80	20	20	120	5	3 Hours
3.	Mech. Engg	**337453(37)**	Applied Thermodynamics	4	1	-	80	20	20	120	5	3 Hours
4	Mech. Engg	**337454(37)**	Kinematics of Machines	4	1	-	80	20	20	120	5	3 Hours
5	Mech. Engg	**382455(37)**	Automotive Chassis	4	1	-	80	20	20	120	5	3 Hours
6	Mech. Engg	**337456(37)**	Manufacturing Science-1	4	1	-	80	20	20	120	4	3 Hours
7	Mech. Engg	**382461(37)**	Fluid Mechanics Lab	-	-	2	40	-	20	60	1	
8	Mech. Engg	**382462(37)**	Automotive Petrol &Diesel Engines Lab	-	-	2	40	-	20	60	1	
9	Mech. Engg	**382463(37)**	Manufacturing Technology Lab	-	-	2	40	-	20	60	1	
10	Mech. Engg	**382464(37)**	Automotive Chassis Lab	-	-	2	40	-	20	60	1	
11	Humanities	**382465(46)**	Health, Hygiene & Yoga	-	-	2	-	-	40	40	1	
12			Library	-	-	1	-	-	-	-	-	
			Total	23	6	11	640	120	240	1000	34	

L – Lecturer T – Tutorial,
P – Practical, ESE – End Semester Exam, CT – Class Test
TA – Teacher's Assessment

Note: (1) Duration of all theory papers will be of **Three Hours.**

Note: (2) Industrial Training of six weeks in mandatory for B.E. student. It is to be completed in two parts. The first part will be in summer after IV sem. after which students have to submit a training report which will be evaluated by the college teachers during B.E. V sem.

Chhattisgarh Swami Vivekanand Technical University,Bhilai

Name of the program: Bachelor of Engineering
Branch: Automobile Engineering **Semester: IV**
Subject: Fluid Mechanics **Code: 337451(37)**
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 Objectives:

Obtaining a solid understanding of the fundamentals of Fluid Mechanics
The ability to formulate basic equations for Fluid Engineering problems
The ability to use tables and figures to determine the friction energy loss for various pipes/ducts geometries and Fluid engineering applications
The ability to perform dimensional analysis and identify important parameters

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'slaw, 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-pathline,streakline,streamline,streamtube.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, Venturi meter, 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(Counter 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'smodel 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 –NewDelhi
2. A text of Fluid Mechanics –R. K. Rajput – S. Chand & Company Ltd., Delhi

Reference Books:

1. Fluid Mechanics & Hydraulics Machines-R.K.Bansal-LaxmiPublications.,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, JohnM. 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-TMHDelhi

Course Outcomes:

Apply knowledge of Fluid Mechanics formulating and solving engineering problems.
Acquire knowledge of fluid mechanics for the design and development of mechanical systems.
Demonstrate creativeness in designing new systems components and processes in the field of engineering and mechanical engineering in particular.
Identify, analysis, and solve mechanical engineering problems useful to the society.
Work effectively with engineering and science teams as well as with multidisciplinary designs.
Skillfully use modern engineering tools and techniques for mechanical engineering design, analysis and application.
Develop fundamentals to continue the study of the advance subject fluid machinery, Heat and mass transfer etc.

Chhattisgarh Swami Vivekanand Technical University,Bhilai

Name of the program: Bachelor of Engineering
Branch: Automobile Engineering **Semester:IV**
Subject: Automotive Chassis **Code:382455(37)**
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**

COURSEOBJECTIVES

The ability to know the basics of Automobile Chassis Components.
The ability to know the Construction and Working principle of Front Axle, Rear Axle, Wheels, Tyres, Final Drive, Steering System.
The ability to Braking system in automobiles
The ability to Suspension System Wheels and Tyres.

UNIT-I

INTRODUCTION

Types of chassis layout with reference to power plant locations and drive, Vehicle frames. Various types of frames. Constructional details, Materials. Testing of vehicle frames. Unitized frame body construction: Loads acting on vehicle frame.

UNIT-II

FRONT AXLE AND STEERING SYSTEM

Types of front axles. Construction details. Materials.Front wheel geometry viz. Castor, Camber, King pin inclination, Toe-in-Conditions for true rolling motion of wheels during steering, turning radius, Wheel wobble and shimmy. Ackerman and Davis steering system Constructional details of steering linkages. Different types of steering gear boxes. Steering linkages and layouts for conventional and independent suspension system. Power and power assisted steering.

UNIT-III

DRIVE LINE, REAR AXLE, FINAL DRIVE, AND DIFFERENTIAL

Effect of driving thrust and torque reactions. Hotchkiss drive, torque tube drive and radius rods. Propeller shaft. Universal joints. Constant velocity universal joints. Front wheel drive. Construction of rear axles. Types of loads acting on rear axles. Full floating. Three quarter floating and semi floating rear axles. Rear axle housing. Construction of different types of axle housings. Multi axled vehicles. Construction details of multi drive axle vehicles. Different types of final drive. Double reduction and twin speed final drives. Differential principles. Constructional details of differential unit. Non-slip differential. Differential lock-Differential housing.

UNIT-IV

SUSPENSION SYSTEM

Need of suspension system - Types of suspension - Suspension springs - Constructional details and characteristics of leaf, coil and torsion bar springs-Independent suspension -Rubber suspension –Pneumatic suspension–HydroElasticsuspension-Shockabsorbers.Vibrationanddrivingcomfort.

UNIT-V

BRAKING SYSTEM, WHEELS AND TYRES

Necessity of brake, stopping distance and time, brake efficiency, weight transfer, shoe brake and disc brake theory. Determination of braking torque. Brake actuating systems -Mechanical, Hydraulic and Pneumatic – Detailed study of components. Parking and engine exhaust brakes. Factors influencing brake performance. Power and power assisted brakes. Antilock Braking System (ABS).
Types of wheels - construction. Function of tyres- Solid and pneumatic Tyres. Constructional details of pneumatic tyres.

TEXTBOOKS

1. Automotive Chassis-Brakes, Steering and Suspension, Tim Gilles, Thomson Delmer Learning, 2005
2. Automotive Chassis,- HeldtP.M.,ChiltonCo.,NewYork,1990.

REFERENCEBOOKS

1. Automotive Braking Systems-Birch, Thomson Asia, 1999.
2. Automotive Chassis Systems- Birch, Thomson Asia, 2000.
3. Automotive Suspension and Steering Systems- Birch, Thomson Asia,1999.
4. TheMotorvehicle,SAE-Newton,Steeds&Garrot,Butterworths,India,13th edition,2001.
5. Mechanism of the car- Judge A.W.Chapman and Halls Ltd., London, 1986

Course Outcomes:

Acquire knowledge and hands-on competence in applying the concepts of auto chassis in the design and development of automobiles.
Demonstratecreativenessindesigningnewsystemscomponentsandprocessesinthefieldof Automobile Engineering.
Identify, analysis, and solve automobile engineering problems useful to the society

Chhattisgarh Swami Vivekanand Technical University,Bhilai

Name of the program: Bachelor of Engineering
Branch: Automobile Engineering **Semester: IV**
Subject: Applied Thermodynamics **Code: 337453(37)**
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 OBJECTIVES

To understand the applications of engineering thermodynamics in real life situations
To perform gas power cycle analysis
To perform vapour power cycle analysis
To analyze steam condenser, cooling pond and cooling towers.
To analyze thermodynamic system with compressible fluid.

UNIT-I

Gas power cycles: An over view of reciprocating engine, Air standard cycle, Otto, Diesel, 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 Stirling, Erricson, Atkinson and 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. Multi-stage reciprocating air compressors, advantage of multi-stage 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

Vapour 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 vapour 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, are a 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.

TextBooks:

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

ReferenceBooks:

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 ,UniversityPrass, Hyderabad
5. Thermodynamics &Thermal Engineering –J. SelwinRajadurai –New Age International Publishers
6. Thermodynamics –C.P. Arora – TMH , Delhi
7. Thermodynamics –S.C. Gupta –Pearson Education,Delhi

Course Outcomes:

Apply knowledge of classical thermodynamics for formulating and solving engineering problems.
Acquire knowledge and hands-on competence in applying the concepts of thermal sciences in the design and development of mechanical systems.
Demonstrate creativeness in designing new systems components and processes in the field of Engineering general and mechanical engineering in particular.

Chhattisgarh Swami Vivekanand Technical University,Bhilai

Name of the program: Bachelor of Engineering
Branch: Automobile Engineering **Semester: IV**
Subject: Kinematics of Machines **Code:337454(37)**
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 Objectives:
To synthesis, both graphically and analytically, multilink mechanisms.
To perform mechanism analyses to find the position, velocity, acceleration, and dynamics of multi-bar mechanisms.
To synthesis mechanism to perform certain prescribed task/motion
To analyze gear trains.
To analyze thrust bearings, Brakes and dynamometers.

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 under cutting 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.

TextBooks:
1. Theory of Machine– S.S.Ratan-TataMcGrawHill.
2. The Theory of Machine–ThomasBeven–CBSPublishers.

ReferenceBooks:
1. Theory of mechanism and machine–A.Ghosh,A.K.Mallik–EWP Press.
2. Theory of Machine– Shigley,JE
3. Theory of Machine-Jagdish Lal
4. Theoryofmachine– J.E.Singh–McGrawHill.

Course Outcomes:
Apply knowledge of Kinematics of machine for understanding, formulating and solving engineering problems.
Acquire knowledge and hands-on competence in applying the concepts kinematics of machine in the design and development of mechanical systems.
Demonstrate creativeness in designing new systems components and processes in the field of engineering.
Identify, analysis, and solve mechanical engineering problems useful to the society.
Work effectively with engineering and science teams as well as with multidisciplinary designs.

Chhattisgarh Swami Vivekanand Technical University,Bhilai

Name of the program: Bachelor of Engineering
Branch: Automobile Engineering **Semester: IV**
Subject: Automotive Diesel Engines **Code:382452(37)**
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 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 Compression ignition engine.
To impart knowledge about fuel injection, super charging and turbo charging.
To impart knowledge about testing and performance of Diesel Engine

UNIT-I **Basic theory:** Diesel engine construction and operation, two stroke and four stroke diesel engine, dual cycle engines, diesel cycle, fuel-air and actual cycle analysis, diesel fuel ,ignition quality, Cetane number, diesel fuels standards and specifications.

UNIT-II **Fuel injection system:** Types of fuel injection system, Requirements, air and solid injection, functions of components, jerk and distributor type pumps common rail system, PTFI system pressure waves, injection lag, unit injector, mechanical and pneumatic governors, fuel injector, types of injection nozzle, spray characteristics, injection timing, pump calibration.

UNIT-III **Air motion, combustion and combustion chambers:** Importance of air motion, swirl, squish and turbulence, swirl ratio, fuel air mixing, stages of combustion, delay period, factors affecting delay period, knock in CI engines. Combustion chamber: design requirements, direct and indirect injection combustion chambers, M type combustion chamber. Introduction-Inlet Manifold, Construction with reference to Efficiency.

UNIT-IV **Super charging and turbo-charging:** Necessity and importance of super charger, types of super charging and turbo charging, relative merits, design of Turbo charger Variable Geometrical Techniques, exhaust gas re -circulation, charge cooling & Lubrication.

UNIT-V **Diesel engine testing and performance:** Automotive and stationary diesel engine testing and related emission standards. Engine performance and emission characteristics, variables affecting engine performance and emission, methods to improve engine performance, heat balance, performance maps. Engine management systems, CRDI, etc., Performance, emission, Calculation & Testing of Emissions, Heat Release Analysis

TEXTBOOKS

1. A Course in Internal Combustion Engines–M.L.Mathur&R.P.Sharma–DhanpatRai&Sons
2. Internal Combustion Engine–V.Ganeshan–TMH

REFERENCESBOOKS

1. A Course in Internal Combustion Engine–V.M.Domkundwar–DhanpatRai&Sons
2. Internal Combustion Engine–R.Yadav–CentralPublishingHouse,Allahabad
3. Fundamentals of Internal Combustion Engine–PaulW.Gill,JamesH.Smith,EugeneJ.Ziurys–Oxfordand IBH Publishing Company
4. Internal Combustion Engines–R.K.Rajput–Laxmi Publications

Course Outcome:
Demonstrate a basic understanding of C.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: IV**
Subject: Manufacturing science-I **Code: 337456(37)**
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**

COURSEOBJECTIVES

- To understand various manufacturing processes & its classifications
- To understand various Casting processes
- To understand various welding processes
- To understand various metal removal process
- To appreciate the capabilities, advantages and the limitations of the 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, 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:

- Acquire knowledge and hands-on competence in applying the concepts of manufacturing science 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.
- Work effectively with engineering and science teams as well as with multidisciplinary designs.
- Skillfully use modern engineering tools and techniques for mechanical engineering design, analysis and application.

Chhattisgarh Swami Vivekanand Technical University,Bhilai

Name of the program: Bachelor of Engineering
Branch: Automobile Engineering **Semester: IV**
Subject: Fluid Mechanics Lab **Code: 382461(37)**
Total Lab Periods: 24 **Batch Size: 30**
Maximum Marks: 40 **Minimum Marks: 20**

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 Venturi meter and study the variation of co-efficient 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 (Cc, Cd and Cv)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 co-efficient of an open channel.

List of Equipment/Instruments/Machines/Software Required:

Apparatus for determination of meta centric height
Bernoulli's apparatus
Impact of jet apparatus
Venturi meter
Orifice meter
Pipe friction apparatus
Orifice apparatus
Mouth Piece apparatus with the provision for determination of hydraulic coefficient Cc, Cd &Cv
Vortex flow apparatus
Apparatus of head loss in various pipe fittings.
Reynold's apparatus
Complete set up for flow measurement using Pitot tube
Complete set for open channel apparatus

Chhattisgarh Swami Vivekanand Technical University,Bhilai

Name of the program: Bachelor of Engineering
Branch: Automobile Engineering **Semester: IV**
Subject: Automotive Chassis Lab **Code: 382464(37)**
Total Lab Periods: 24 **Batch Size: 30**
Maximum Marks: 40 **Minimum Marks: 20**

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

1. Study of hand tools, sketching and its uses, study of different types of chassis layouts, components.
2. Disassembling cylinder head, servicing of valves, adjusting tappet clearance, testing valve spring tension with spring tester
3. Disassembling of engine, inspection of components, servicing of components, de-carbonising procedure, measurement of dimension of different components of engine, compare with standard specifications, piston ring testing, assembling using special tools.
4. Valve timing & adjustments off a belt tension.
5. Compression test of petrol and diesel engine.
6. Rectifying the troubles in ignition system, adjusting spark plug and CB Point gap, checking ignition timing.
7. Servicing of carburetor, carburetor adjustments, tuning of carburetors.
8. Servicing of A.C.Mechanical fuel pump and testing the pump.
9. Servicing of fuel injection pump, injector, testing of injector
10. Servicing of clutch assembly, checking the spring tension of coil springs in spring tester.
11. Dismantling of gear box, inspecting Components, servicing, checking the gear ratios.
12. Dismantling of differential assembly, servicing, back lash adjustments, check for drive axle ratio.
13. Servicing of steering gear box, checking for end play.
14. Servicing master and wheel cylinders in hydraulic brake system, bleeding of brakes.
15. Preparing immature models of body structures of cars, jeeps, van and heavy duty vehicles.(By adopting suitable scales prepared by sheet metalwork)

Chhattisgarh Swami Vivekanand Technical University,Bhilai

Name of the program: Bachelor of Engineering
Branch: Automobile Engineering **Semester: IV**
Subject: Manufacturing Technology Lab **Code: 382363(37)**
Total Lab Periods: 24 **Batch Size: 30**
Maximum Marks: 40 **Minimum Marks: 20**

EXPERIMENTS TO BE PERFORMED (MINIMUM TEN EXPERIMENTS)

Shaper Machine
1. Study of Quick Return Mechanism and Table feed mechanism.
2. V groove in C.I. Block.

Milling Machine
3. Study of indexing mechanism (simple and differential)
4. Study of different milling cutters and operations.(End cutter, Face cutter & T-Slot cutter)
5. Gear Cutting

Lathe
6. Study of Work holding devices.
7. Facing, straight turning, step turning & taper turning.
8. Thread cutting and knurling.
9. Boring
10. Preparation of Solid of revolution using wood working lathe.

Welding
11. Joining of metals by Arc welding
12. Joining of metals by Spot welding (Metallic sheets)
13. Joining of metals by Soldering & Brazing (Metallic wires)
14. Joining of metals using MIG welding (Metallic plates)

Molding
15. Preparation of solid & split pattern.
16. Preparation of non-ferrous casting using solid and split pattern.

Advanced Fitting
17. Drilling, Filing tapping and assembly of casting produced on a base plate.

LIST OF EQUIPMENTS/MACHINES REQUIRED
1. Center Lathe
2. Wood Working Lathe
3. Capstan & Turret Lathe
4. Shaper Machines
5. Milling Machines
6. MIG Welding Machines
7. Spot Welding Machine
8. Drilling Machine
9. Open Hearth Forging Furnace.
10. Carpentry Tools
11. Fitting Tools
12. Molding Tools
13. Measurement Tools
14. Equipments for costing of nonferrous material.
15. Slotter and Planner Machines

Chhattisgarh Swami Vivekanand Technical University,Bhilai

Name of the program: Bachelor of Engineering
Branch: Automobile Engineering **Semester: IV**
Subject: Automotive Petrol &Diesel Engines Lab **Code: 382462(37)**
Total Lab Periods: 24 **Batch Size: 30**
Maximum Marks: 40 **Minimum Marks: 20**

List of Experiments (Minimum Six experiments and Four studies are to be performed by each student)

1. Study of IC Engine. (Engine components, material used and engine nomenclature)
2. Study of working of four stroke petrol engine and four stroke diesel engine with the help of cut section models.
3. Study of working of two stroke petrol and two stroke diesel engine with the help of cut section models.
4. Study of fuel supply system of a petrol engine (fuel pump and simple carburettor)
5. Study of complete caurburettor
6. Study of Petrol Injection System.
7. Study of fuel supply system of a Diesel engine (fuel pump and fuel injector)
8. Study of Ignition systems of an IC Engine (Battery and Magneto ignition system and Electronic ignition system).
9. Study of Lubrication system of an IC Engine (Mist, Splash and Pressure lubrication)
10. Study of cooling systems of an IC Engine (Air cooling and water cooling)
11. To conduct a performance test on diesel engine to draw heat balance sheet for given load and speed.
12. To determine friction power of diesel engine by Willan's line or fuel rate extrapolation method.
13. To conduct a performance test on the variable compression ratio engine and to draw the heat balance sheet for given compression ratio, speed and load and plot the performance curves.
14. To conduct a performance test on a four cylinder four stroke petrol engine and to draw the heat balance sheet and performance curves.
15. To calculate the indicated power, friction power and mechanical efficiency of four stroke four cylinder petrol engine at full load and rated speed by Morse test.
16. To draw the valve timing diagram of a four-stroke S.I. or C.I. Engine using experimental setup.
17. Analysis of engine exhaust gases using Orsat apparatus / gas analyzer.

LIST OF EQUIPMENTS/MACHINES REQUIRED

1. Model of Two & Four Stroke Petrol Engine
2. Model of Two & Four Stroke Diesel Engine
3. Single Cylinder Actual S.I.Engine in Cut Section
4. Single Cylinder Actual C.I..Engine in Cut Section
5. Four Stroke, Four-Cylinder Petrol Engine in Cut Section
6. Carburettors in Cut Section / Without Cut Section.
7. Model of Petrol Injection System
8. Bosch Fuel Pump in Cut Section
9. Nozzles in Cut Section
10. Diesel Injectors in Cut Section
11. Four Stroke Single-Cylinder Diesel Engine Test Rig
12. Variable Compression Ratio Engine Test Rig
13. Four Stroke Multi-Cylinder Petrol Engine Test Rig
14. Experimental Setup for Drawing Valve Timing Diagram Of Four Stroke S.I. or C.I. Engines.
15. Orsat Apparatus / Gas Analyzer for Engine Exhaust Gas Analysis.

Chhattisgarh Swami Vivekanand Technical University,Bhilai

Name of the program: Bachelor of Engineering
Branch: Automobile Engineering **Semester: IV**
Subject: Health, Hygiene& Yoga **Code: 382465(46)**
No Periods: 2 per week **Total Tutorial periods:Nil**
Maximum Marks: 40 **Minimum Marks: 24**

Course Objectives
To provide understanding the importance of health.
To provide in sight in to the hygiene aspect & quality of life.
To study the concepts of various medica therapy.
To practice the various yogasans.
Toprovideknowledgeaboutcommondiseasesanditscurethroughyagasansandpranayam.
To develop concentration through various methods.

UNIT- I **HEALTH & HYGIENE:** Concept of health, Physical health and mentall health and wellbeing and how to achieve these, longevity and how to achieve it, concept and common rules of hygiene, cleanliness and its relation with hygiene; Overeating and underrating, amount of food intake required, intermittent fasting; adequate physical labour, sleep; consumption of junk fast food vs nutritious food; fruits, vegetables cereals and qualities of each of these.

UNIT-II **INTRODUCTORY KNOWLEDGE OF COMMON STREAMS OF MEDICINAL CURE:** History, development, basic concepts, modes of operation of Alopathy, Ayurved, Homoeopathy, Biochemic, Unani, Siddha, Accurpressure, Accupunture, Naturopathy, Yogic and Herbal system of medicines, Introduction of Anatomy and Physiology concerned.

UNIT- III **YOGASANS:** Meaning and concept of Yoga, Yogasans and its mode of operation, How to perform Yogasans, Common Yogasans with their benefits, such as, Padahastasan, Sarvangasan, Dhanurasan, Chakrasan, Bhujangasan, Paschimottasan, Gomukhasan, Mayurasan, Matsyasan, Matsyendrasan, Pawanmuktasan, Vajrasan, Shalabhasan, Sinhasan, Shashankasan, Surya Namaskar, Halasan, Janushirasan, Utshep Mudra.

UNIT-IV **YOGASANS FOR COMMON DISEASES:** From Yogic Materia Medica with symptoms, causes, asans and herbal treatment.

Modern silent killers: High blood pressure, diabetes and cancer, causes and cure; Common health problems due to stomache disorders, such as, indigestion, acidity, dycentry, piles and fissures, artheritis, its causes, prevention and cure.
Asans for relaxation: Shavasan, Makarasan, Matsyakridasan, Shashankasan.
Asans to increase memory and blood supply to brain: Shirsh padasan, Shashankasan.
Asans for eye sight: Tratak, Neti Kriya .
Pranayam: Definition and types: Nadi Shodhan, Bhastrik, Shitakari, Bhramari useful for students.

Text Books:
Health, Hygiene & Yoga, Dr P B Deshmukh, Gyan Book Pvt Ltd. New Delhi.
Reference Books:
(1) Yogic Materia Medica
(2) Asan, Pranayam and Bandh.