



DEPARTMENT OF MECHANICAL ENGINEERING

GOVERNMENT CO-ED POLYTECHNIC, BASTAR

Adawal near R.T.O., Jagdalpur, Bastar (C.G.)-494001

E-mail: mechanical.gcpb@gmail.com

LESSION PLAN

Name of the faculty :- Mr. AMAR XALXO

Semester :- 5th

Subject Name- Automobile Engineering 2037571(037)

Lesson Plan Duration (L+P+T) :- 80Hrs (From Sept. To Dec. 2024)

S.No.	No. Of Periods	Topic Name	Practicals
	(Approx.Hrs: L+P+T =16)	Unit-1.0 Essentials of Automobile	
1	2	Introduction, classification of automobiles, Types of automobiles. Two wheeler/Light Commercial Vehicle/Sport Utility Vehicle/Heavy commercial Vehicles	LE1.1 Identify vehicle layout and its chassis.
2	3	Layout of automobile, importance of vehicle layout, types of vehicle layout (FEFWD, FERWD, RERWD, 4WD), Advantages, Disadvantages, Applications and Comparisons of Different types of vehicle layouts, Major components of the automobile and its functions and location.	LE1.2 Dismantle internal Combustion engines of the given vehicle.
3	3	Layout of chassis, Frame and Body: <input type="checkbox"/> Requirement of Chassis, classification of chassis. Function of Chassis <input type="checkbox"/> Frame and Body, Load acting on Frame, advantages, disadvantages and applications of different types of chassis, Basic Body Nomenclature.	LE1.3 Assemble Internal Combustion engines of the given vehicle
4	2	Significance of Body Streamlining: Need and Importance of Aerodynamic Aspects, Basic terms related with Car Aerodynamics (e.g. Drag, Lift, Skin Friction, Form Drag, Wake, Coefficient of Drag etc.)	LE1.4 Dismantle the Carburetor of the given vehicle.
5	2	Automotive engines Types of Automobile Engines: Petrol Engine, Diesel Engine. Engines locations - front, rear and transverse underfloor with their advantages and disadvantages.	LE1.5 Assemble the Carburetor of the given vehicle.
6	4	Engine Constructional features : Engine block, engine heads, crank case oil pan, cylinder liners, Gasket, combustion chambers with their types, piston, piston pin, gudgeon pin, connecting rod, crank shaft, cam shaft, Valve & valve mechanism. Valve timing /port timing diagram, timing gears, Inlet & Exhaust mufflers, concept of firing order in multi-cylinder engine. Lubrication and cooling.	LE1.6 Identify the location of engine in the given vehicle.
	(Approx. Hrs: L+P+T =14)	Unit-2 Fuel supply system and auto-electric and electronic	LE1.7 Identify different constructional features of given petrol engine.
1	1	Introduction of fuel system for petrol engine. Gravity feed system, Fuel pump, Simple and Solex carburetor.	LE1.8 Identify different constructional features of given diesel engine.
2	2	Concept of Petrol Injection (Mechanical and Electronic injection systems) & MPFI Petrol injection systems. Concept of supercharging.	LE2.1 Dismantle & assemble the Carburetor.
			LE2.2 Identify the electrical and electronics part of the given vehicle.

3	2	Introduction of fuel system for diesel engine Concept of Fuel injection systems and Its Construction, Working of Fuel injection pump and their types, Fuel injector.	LE2.3 Dismantle and assemble the given fuel supply system. LE2.4 Identify the different parts of fuel injection system LE2.5 Test a Lead Acid Battery for Open Voltage and Specific Gravity. LE2.6 Dismantle reassemble the Distributor used in Battery Ignition System. LE2.7 Prepare a simple electrical circuit for Automobile applications like Lighting/Horn/Wiper/Flas her/Indicators.
4	2	Electrical and Electronic system Basic Electrical- Electronics Components used in automobiles with their conventional symbols. Main Components of the Electrical and electronic System. Function of Starting and charging systems, construction and Working of Alternator.	
5	2	Ignition System, Function and Requirement of Ignition System, Distributor, Ignition Coil, Ignition Timing, Ignition Advance, coil and Electronic Ignition System.	
6	3	Lighting system, Automobile Battery-Function of Battery, Types of Battery, Principle of Lead Acid Battery, Construction and Operation of Lead Acid Battery Low maintenance and Maintenance-free Batteries., Significance of Battery Rating & Battery Capacity, Battery Open Volt and Specific Gravity Test. Types of Lights, Necessity and Importance of Cable Color Codes, Wiring Harness.	
7	2	Different types of Gauges, Windscreen wiper, Function & Location of Major Sensors and Actuators used in Automobile Electronics	
	(Approx. Hrs: L+P+T=14)	Unit-3.0 Brakes, Clutch and Suspension systems	
1	1	Need & function of braking system, principle of braking system, Brake efficiency, stopping distance and basic terms related to braking.	LE3.1 Dismantle and assemble of the given brake assembly.
2	2	Electric and Electronic technology used in braking system Foundation brakes - drum and disc brakes, Hydraulic and pneumatic brakes, Self energized brakes, Power brakes, Air brakes, Emergency & Parking Brakes	LE3.2 Dismantle and assemble the given clutch assembly.
3	1	Floating-caliper brakes, ceramic pads, twin brake disc systems, hybrid systems, coated discs, anti-squeal technology	LE3.3 Dismantle, inspect and reassemble the Differential Assembly
4	1	Electronic brakes - EPB (electric park brake), ESP (electronic stability control), braking assistance, predictive braking, brake- by-wire, slip control, regenerative braking, autonomous emergency braking	LE3.4 Dismantle, inspect and reassemble the Drum/Disc Brake LE3.5 Identify the electronic and electrical parts used in the given engine.
5	2	Anti lock braking System: Layout of ABS, Pressure Modulation, and Types of ABS.	LE3.6 Dismantle and assemble the given suspension system.
		Construction and Working of Master Cylinder, Wheel Cylinder, Tandem Master Cylinder, Significance and general procedure of Bleeding of Brake.	LE3.7 Identify the different components and basic features of Independent Suspension System
6	1	Clutch system Need and function of clutch system, construction and working of clutch system, classification of clutch Types of clutch systems Single plate and multi plate clutch, Centrifugal clutch, Semi centrifugal	

		clutch	for the given vehicle.
7	1	AMTs (automate manual transmission), CVTs, DCTs (direct-shift, Hybrids clutch.	
8	2	Suspension system Function of Suspension system, construction and working of Suspension system, classification of Suspension system, Types of suspensions used in automobiles.	
9	1	Function and Requirement of Rigid Suspension System: Basic Terms - Jounce, Rebound, Sprung and Unsprung Weight, Spring Rate, Elasticity, Types and Constructional Features of Leaf Springs,	
10	1	Function of Independent Suspension System, Advantages of Front Wheel Independent Suspension, Construction and Working of Mac- Pherson Strut Type, Wishbone Type Suspension system.	
11	2	Shock Absorbers and Air Suspension: Layout, Construction and Working of Air Suspension, Function and Types of Shock Absorber, Principle of Hydraulic Shock Absorber, Construction and Working of Telescopic Shock Absorber, Constructional Features & working of Gas Filled Shock Absorber	
	(Approx. Hrs: L+P+T=18)	Unit-4.0 Automobile Transmission system	
1	2	Need and functions of transmission system. Concept of various road resistances such as wind, Gradient, Resistance, Total resistance, Tractive- effort.	LE4.1 Dismantle & assemble the gear boxes in the vehicle.
2	3	Types of transmission systems. Need of gear box, function and working of gear box, construction of gear box, types of gear boxes – sliding mesh. Constant mesh, synchromesh gear boxes, mathematical analysis of gear boxes, Gear shifting mechanisms, five speed gear box.	LE4.2 Dismantle and assemble differential system.
3	4	Function , construction and working of Torque converter, Overdrive automatic transmission, fluid flywheel and epicyclic gear trains.	LE4.3 Identify different rear axle shaft and its drives from the given sample.
4	3	Functions of propeller shaft, types of propeller shaft, Universal joints & slip joints on propeller shaft. Function & need of differential Final drive and differential	LE4.4 Identify different type of gearboxes from the given sample
5	2	Axles: function and need of axles, types of axles, Function and need of rear axle such as semi floating, fully floating, Three quarter floating.	
6	3	Rear axle drives such as Axles: function and need of Hotchkiss type, torque tube type. Function and need of Front Axle, Types of (Front) Stub axle	
	(Approx. Hrs: L+P+T=11)	Unit-5.0 Automobile Steering and Tyre system	

1	2	Steering system Function of the steering system, Steering wheel & column, Basic Terms related to Steering- Steering Ratio, Turning Radius, Under steering and Over steering, Basic Components of Steering Linkages Steering geometry, adjusting the steering angles, Ackerman principle.	LE5.1 Disassembly and assembly of the steering system. LE5.2 Identify different components of steering linkages in the given steering mechanism.
2	1	Construction and Working of Rack and Pinion, Re-circulating Ball Type Steering Gear Box Power steering, Principle of Power Steering	LE5.3 Dismantle, and reassemble the Steering Gear box. (Rack & Pinion/Re-circulating Type/Worm and Wheel)
3	2	Construction and Working of Hydraulic and Electronic Power Steering. Significance and ranges of Caster (Positive, Negative), Camber (Positive, Negative), Toe-in, Toe out, King Pin Inclination (KPI), Steering Axis Inclination (SAI)	LE5.4 Dismantle, and reassemble the Power Steering system. (Hydraulic/Electronic Type)
4	2	Tyre system Types of Automobile Wheels, Rims and Tyres, Construction and Working of Different Types of Wheels, Rims and Tyres, specifications. Criteria for Selection of tyre.	LE5.5 Remove, inspect and refit the Wheel and Tyre assembly.
5	2	Wheel alignment and balancing, procedure of Wheel Alignment, Purpose of Wheel Balancing, Significance of Static and Dynamic Balancing, Procedure for Static and Dynamic Balancing.	LE5.6 Perform the wheel alignment and balancing of the given vehicle.
7	2	Tyre Economy: Consideration in Tyre Tread Design, Factors affecting to Tyre Life, Tyre Wear and Rotation, Tyre Designation.	
	(Approx. Hrs: L+P+T=10)	Unit-6.0 Automobile Emissions and its Control	
1	2	Introduction, Complete and Incomplete Combustion. Constituents of Exhaust Gases, Pollutant Formation	LE6.1 Use Exhaust gas Analyzer to investigate the characteristic of petrol & diesel exhaust gas
2	2	Effect of Air Fuel Ratio on Exhaust Emission, Effect of Driving Mode on Exhaust Emission, Sources of Pollutants in an Automobile	LE6.2 Determine the characteristics of the given fuel.
3	2	Control Approaches for Automobile Emission Muffler, Alternative Fuels Layout of Vehicle operated on Natural Gas (LPG & CNG):Need, Fuel Characteristics, Construction & Working, Advantages, and Limitations. Layout of Electric Vehicles: Need, Working, Advantages, Limitations. Hydrogen as fuel.	
4	2	Motor Vehicle Act Salient Features of M. V. Act 1988 and Central Motor Vehicle Rules 1989. 6.1.2, Types and Significance of Traffic Signs, Important Transport Terms in M. V. Act (Motor Vehicle, Motor Cycle, HGV, MGV, LGV, Public Service Vehicle, Transport Vehicle, Driver, Passenger, Accident)	
5	2	Passenger Comfort and Safety, Function and requirements of Passenger Safety System. Features of Air Bags, Seat Belts, Collapsible Steering Column.	

GOVERNMENT CO-ED POLYTECHNIC JAGDALPUR

DEPARTMENT OF MECHANICAL ENGINEERING

LESSON PLAN

Course- Machine Design, Estimation and Costing

Course Instructor – SHAILESH SIDAR

Semester - 5

TOPIC	NO. OF PERIODS (HOURS)
UNIT -1 Fundamentals of Machine Components Design	06
1.1 Basic concepts of design in general	01
1.2 Factors to be considered in design of machine components a. Selection of Mechanism b. Material c. Loading and Forces on the elements d. Size, shape and space requirements e. Manufacturing f. Operating requirement g. Reliability and safety aspects h. Inspectability i. Maintenance, cost and aesthetics of the designed product j. Failure criterion	02
1.3 Codes and Standards in Machine Design	02
1.4 Engineering Materials a. Properties and applications of common engineering materials. b. Important mechanical properties of materials: Elasticity, Plasticity, Hardness, Ductility, Malleability, Brittleness, Resilience Toughness, Creep etc.	01
UNIT-2 Design for Static Loading	08
2.1 Types of loads, Types of stresses, strains and strengths.	02
2.2 Factor of safety and stress concentration factor.	01
2.3 Design under static single axial loading conditions.	02
2.4 Theories of failure.	01
2.5 Design under static Multiaxial loading conditions.	02
UNIT-3 Design of Shaft, Axle, Keys and Couplings	09
3.1 Types of shafts, Shaft materials, Standard sizes.	02
3.2 Design of solid and hollow Shaft and Axles under twisting moment (TM), Bending Moment (BM). a. Geometric Layout b. Deflection and Rigidity c. Design procedure of solid and hollow shaft based on strength d. Design procedure of solid and hollow shaft based on stiffness.	03
3.3 Types of keys, effect of keyway on the strength of shaft, design of rectangular and square sunk key.	02
3.4 Design of Couplings (Muff coupling and Rigid Protected Flange coupling)	02
UNIT-4 Design of fasteners	09
4.1 Advantages and disadvantages of riveted joints	01
4.2 Methods of riveting, types of rivet heads, Rivet material and properties, kinds of riveted joints	01
4.3 Failure of riveted joints, Design of riveted joints, efficiency of riveted joints (including eccentrically loaded)	01
4.4 Boiler joints	01

4.5 Types of welded joints, representation of welds	01
4.6 Design of welded joints for static loads	01
4.7 Strength of welded joints at varying loads	01
4.8 Introduction to threaded joints, types of screw fastening, profile of screw threads, materials for fasteners	01
4.9 Design of bolted joints in various loading conditions (including eccentrically loaded)	01
UNIT-5 Antifriction Bearings	
5.1 Classification of Bearings –Sliding contact and rolling contact.	02
5.2 Terminology of Ball and Roller bearings – life load relationship, basic staticload rating and basic dynamic load rating.	03
5.3 Selection of ball bearings using manufacturer’s catalogue.	03
UNIT-6 Fundamentals of Estimating and Costing	
6.1 Definition and aims of Estimating, Functions of Estimating and role of Estimating department.	01
6.2 Estimating Procedure and constituents of Estimation.	01
6.3 Definition and aims of Costing.	01
6.4 Difference between Estimating and Costing.	01
6.5 Procedure of Costing, Costing Methods.	
6.6 Advantages of efficient costing	01
6.7 Elements of Cost- Material, labour, expenses.	
6.8 Direct and Indirect cost: Factory expenses, administrative expenses, selling expenses and distribution expenses.	01
6.9 Components of cost	01
UNIT-7 Estimation and Costing Applications	
7.1 Terminology used in machine shop like cutting speed, feed and depth of cut	01
7.2 Lathe Operations- Turning, Facing, Knurling, Drilling, Boring, Reaming, Threading and Tapping	02
7.3 Estimation of volume and weight of material	02
7.4 Use of formula to calculate actual machining time for different machining operations	01
7.5 Estimation of time related to Welding shop	01
7.6 Estimation of time related to Forging shop	01
7.7 Estimation of time related to Pattern making and Foundry shops	01

No. of Periods (Hours): 56

GOVERNMENT CO-ED POLYTECHNIC, JAGDALPUR
BASTAR(C.G)
DEPARTMENT OF MECHANICAL ENGINEERING
LESSON PLAN

Session: - Nov-Dec 2024

Semester: - 5TH

Session start date as per University Calendar: - 09.09.2024

Course Name: - **Machine Tool Technology**

Course Code: - **2037573 (037).**

Name of Subject teacher: - **BHUPESH SAHU**

CO-1 Apply the basics of metal cutting and machine tools in machining processes.

Class Room Instruction (CI)	No. of Periods	Laboratory Instruction (LI)	No. of Periods	Remark
1.1 Cutting Tools – types, requirements, specification & application of different cutting tools, cutting tool materials – high carbon steels, high speed steels, non-ferrous cast alloys, cemented carbides, ceramics, diamond, Cubic Boron Nitride, properties and applications		LE1.1 Select appropriate cutting tool for a given machining situation and fix it properly in the tool post accurately.		
1.2 Geometry of Single Point Cutting Tool - Tool angle, Tool geometry and influence of tool angles, tool signature, Tool angle specification system, ASA, ORS and inter-relationship.		LE1.2 Interpret the given tool signature and observe the change in angles values if the tool is not fitted accurately in the tool post.		
1.3 Mechanics of Metal Cutting - Theories of metal cutting, Chip formation,		LE1.3 Perform plain turning operations on Steel, Brass and Aluminum etc.		

types of chips, BUE formation condition and its effect upon surface finish, chip breakers, Orthogonal and Oblique cutting, stress and strain in the chip, velocity relations, power and energy requirement in metal cutting.		workpieces and observe the formation of type of chip.		
		LE1.4 Practice orthogonal and oblique cutting.		

Number of periods planned (CI + LI) : 13

Number of periods actually taken :

CO-2 Evaluate the tool life and assess the influence of related parameters over it.

Class Room Instruction (CI)	No. of Periods	Laboratory Instruction (LI)	No. of Periods	Remark
2.1 Cutting forces and tool life - Forces acting on the cutting tool and their measurement, Merchant's circle diagram, dynamometer, force and velocity relationship, Tool wear, Factors causing wear, tool life , tool life equation, variables affecting tool life, Cutting parameters - speed, feed, depth of cut and machining time, economical cutting speed.		LE2.1 Determine the cutting forces under various conditions of cutting using dynamometer.		
2.2 Machinability - Concept and evaluation of Machinability, Mechanism of Tool failure, Machinability index, factors affecting machinability.		LE2.2 Observe the effects of using cutting fluid during a machining operation on the temperature of the tool.		
2.3 Thermal Aspects in Machining- Sources of heat generation in machining and its				

effects, Temperature Measurement techniques in machining, types of cutting fluids, Functions of cutting fluid, Characteristics of cutting fluid, Application of cutting fluids.				
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Number of periods planned (CI + LI) : 13

Number of periods actually taken :

CO-3 Supervise production of jobs on Shaper, Planner and Drilling machines.

Class Room Instruction (CI)	No. of Periods	Laboratory Instruction (LI)	No. of Periods	Remark
3.1 Shaper: Principle of operation, classification, specification, Basic parts and their functions and Applications, safety precautions.		LE3.1 Machine a flat surface using Shaper.		
3.2 Slotter: Principle of working, classification, specification. Basic parts of Slotting machine and their functions and Applications, safety precautions.		LE3.2 Prepare a square and v – groove using Shaper		
3.3 Planer: Principle of operation, Classification, Basic parts and their functions, Specifications and Applications, safety precautions.		LE3.3 Prepare a dove-tail guideway using Shaper.		
3.4 Drilling, Reaming & Boring: Drilling: Principle of operation, Classification, Basic parts and functions, drill nomenclature, other operations like counter boring, counter sinking,		LE3.4 Perform slot cutting operation using Slotter.		

spot facing etc. Reaming: Principle of operation, description of reamers, and types of reaming operations, safety precautions, Boring: Principle of operation, Classification of boring machines, Basic parts and functions, boring operations, boring tools and applications, safety precautions.				
		LE3.5 Perform drilling, reaming, tapping and countersinking operations as per given drawing using a Radial drilling machine.		
		LE3.6 Perform boring operation on lathe machine.		

Number of periods planned (CI + LI) : 18

Number of periods actually taken :

CO-4 Supervise production of jobs on Milling and Broaching machines.

Class Room Instruction (CI)	No. of Periods	Laboratory Instruction (LI)	No. of Periods	Remark
4.1 Milling: Principle of operation, Classification of milling machines, Basic parts and their functions, Specifications.		LE4.1 Make two jobs on milling machine which includes plain milling, slotting using end mill cutter or slitting saw, or side and face milling cutters.		
4.2 Milling cutters – Different types of cutters used in milling, face milling cutter, end milling cutter, Staggered tooth milling cutter, side and face milling cutter, form milling cutters, metal slitting saw etc.		LE4.2 Prepare a spur gear using Universal milling machine.		
4.3 Milling operations – Plain milling, face milling, side milling,				

end milling, straddle milling, gang milling, slotting, slitting, Up milling and down milling, safety precautions.				
4.4 Dividing head – types, function of dividing head, method of indexing, index plates.				
4.5 Broaching: Principle of operation, types of broaches horizontal, vertical, pull, surface-internal and external broaching machines, Basic parts and their function, nomenclature of broach.				

Number of periods planned (CI + LI) : 14

Number of periods actually taken :

CO-5 Supervise grinding and finishing operations.

Class Room Instruction (CI)	No. of Periods	Laboratory Instruction (LI)	No. of Periods	Remark
5.1 Grinder and types of grinding wheel, Types of abrasive materials and their properties, Bonding materials, Grinding wheel classification, condition for selection of grinding wheels, balancing of grinding wheels, glazing, loading dressing and Truing. Designation of grinding wheel.		LE5.1 Perform an external and internal grinding on a given job.		
5.2 Principles of working of grinding machines and functions of main parts, types of grinding processes, function of tool and		LE5.2 Prepare at least 2 jobs using surface grinder/cylindrical grinder.		

work holding devices, Table drive in surface and cylindrical grinders, Types of lubricants and coolants used in Grinding, Grinding defects, their remedy and safety practices.				
5.3 Finishing Processes Definition of micro finishing, honing, lapping, super finishing, polishing and buffing operations, equipment involved, materials used, Tolerances obtained and limitations and applications.		LE5.3 Perform grinding of a given single point cutting tool.		

Number of periods planned (CI + LI) : 11

Number of periods actually taken :

CO-6 Perform installation and testing of machine tools.

Class Room Instruction (CI)	No. of Periods	Laboratory Instruction (LI)	No. of Periods	Remark
Unit 6- Installation and Testing of Machine Tools Foundations, levelling and alignment, Factors affecting the working accuracy of machine tools, Acceptance tests for lathe, Test Charts.		LE6.1 Carry out the installation of a given machine.		
		LE6.2 Perform following acceptance tests for a lathe machine available in Institute's workshop: i. Levelling ii. True running of main spindle iii. Axial Slip of main spindle iv. Parallelism of main spindle		

Number of periods planned (CI + LI) : 11

Number of periods actually taken :

Number of Total periods planned :

Number of Total periods actually taken :

Subject Teacher : BHUPESH SAHU

(Name and Signature)

HOD

(Department of Mechanical Engineering)

Principal

**Govt Co-ed Polytechnic,
Bastar**



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DEPARTMENT OF MECHANICAL ENGINEERING

LESSON PLAN

SESSION: NOV - DEC 2024

Name of Faculty: Rakesh Kumar Ray

Subject: Fluid Power Engineering

Subject Code: 2037575(037)

Semester: Diploma 5th Sem

Text Books	Hydraulic and Pneumatic Controls: Sundaram K Shanmuga
	Industrial Fluid Power: C P Murgudkar

Ref. Books	Hydraulics and Pneumatics: T Jagdeesha
	Introduction to Hydraulics and Pneumatics: Sivaraman

TOTAL CLASS SCHEDULED:	44
TOTAL CLASS TAKEN:	42

Faculty Signature (Rakesh Kumar Ray)

HOD Signature

Principal
Govt. Co-Ed Polytechnic
Jagdalpur, Adawal

LECT. NO.	UNIT NO.	TOPIC TO BE COVERED	DATE OF LECTURE	REMARKS
		UNIT-1 Introduction to Fluid Power Systems	1.10.2024 - 15.10.2024	
1	1	Power transmission modes and their comparison, Concept of Fluid Power,		
2		Transmission of forces in fluid – Pascal’s law,		
3		Application and advantages of fluid power, Basic components of a fluid power system		
4		Oil, Hydraulic & Pneumatic systems: General layout, Applications, Merits, Limitations.		
5		Hydraulic Fluids-Functions and properties		
6		Factors affecting the fluid flow – gravity, friction etc		
7		ISO Symbols used in Hydraulic & Pneumatic system.		
8		Selection of hydraulic fluids.		

LECT. NO.	UNIT NO.	TOPIC TO BE COVERED	DATE OF LECTURE	REMARKS
		UNIT-2 Elements of Hydraulic Systems	16.10.2024 - 30.10.2024	
9	2	Pumps: Classification of pumps, Comparison of positive Displacement Pump & non-positive displacement pumps,		
10		Construction and working of Screw Pump, Gear Pump, Vane Pump.		
11		Construction and working of, Gerotor Pump, Piston Pump		
12		Actuators: Classification of actuators Construction and working of hydraulic actuators,		
13		Linear Actuar and rotary actuators. Actuators: Single acting cylinder actuator, Double acting cylinder actuator		
14		Control Valves for hydraulic system: Classification Direction control valves		
15		Check valve, 2/2,3/2,4/2,4/3,5/2,5/3,		
16		D.C. Valves used in Hydraulics, Standard centre positions, Pressure control valves- relief, unloading.		
17		sequence, counterbalance, Flow control valves- Non compensated, Pressure and temperature		
18		compensated Seals, Filters, Pipes, Hoses, Reservoirs, Accumulators and Pressure intensifiers.		

LECT. NO.	UNIT NO.	TOPIC TO BE COVERED	DATE OF LECTURE	REMARKS
		UNIT-3 Oil Hydraulic Circuits		
19	3	Control of single acting Hydraulic cylinders, Double acting Hydraulic cylinders.	1.11.2024 - 15.11.2024	
20		Speed control Single acting cylinder, double acting cylinder		
21		Meter in, Meter-out circuit, Bleed Off circuit, Unloading circuits,		
22		Regenerative circuits, Counterbalance valve & circuit, speed control of Bi-directional hydraulic motor.		
23		Synchronizing circuits, Sequencing Circuits.		
24		Hydraulic circuits for Milling machine, Shaper machine.		
25		Applications, ISO Symbols used in hydraulic circuits. Common troubles in hydraulic systems, their causes and remedies.		

LECT. NO.	UNIT NO.	TOPIC TO BE COVERED	DATE OF LECTURE	REMARKS
		UNIT-4 Elements of Pneumatic Systems		
26	4	Air Compressors Introduction, Selection of compressor.	16.11.2024 - 30. 11.2024	
27		construction & working of Reciprocating compressors, Rotary compressors		
28		Air treatment-Air receiver, Air Treatment-Moisture separator and Air dryer		
29		FRL unit, Pressure regulator.		
30		Pneumatic actuators: Pneumatic Cylinders - Single acting cylinders, double acting cylinders		
31		Air Motors – Working & construction of Vane Motor, Gerotor motor		
32		Air Motors – Turbine Motor Piston motor, Piston motor.		
33		Electrical actuators for pneumatic systems, Comparison between Air, Hydraulic and Electric actuators.		
34		Pneumatic control valves & its Classification: Direction control valves - 2/2, 3/2, 4/2, 4/3, 5/2, 5/3,		
35		Pressure control valves- relief, unloading, sequence, counterbalance.		
36		Pressure reducing valves, Flow control valves, Quick exhaust valve.		
37	Time delay valve.			

38	Accessories: Pipes, hoses, fittings, Seals and gaskets, Accumulators, heat exchanger, muffler.
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LECT. NO.	UNIT NO.	TOPIC TO BE COVERED	DATE OF LECTURE	REMARKS
		UNIT-5 Pneumatic Circuits		
39	5	Direct/Indirect Control of single acting Air cylinders, Double acting Air cylinders.	1.12.2024 - 15.12.2024	
40		Actuation of Pneumatic motor (Air Motor)		
41		Speed control of double acting cylinder, Bi-directional Air motor. Sequencing circuits.		
42		Time delay operation.		
43		Hydro-pneumatic applications Air-Oil reservoir, Air-Oil cylinder, Air-Oil Intensifier.		
44		Pneumatic sensors, Common troubles in pneumatic systems, their causes and remedies.		



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Name of the faculty :- Mr. Shailesh Sidar

Semester :- 5TH

Subject :- Refrigeration & Air conditioning (2037574 (037))

Lesson Plan Duration (CL+LI+SL) :- 80 Hrs

S.No.	No. Of Periods	Topic Name	Practicals
(Approx.Hrs: CI+ LI =15)		Unit-1.0 Refrigeration and Refrigeration Cycles	
1	2	Introduction to Refrigeration, different terminology of RAC machineries	LE-1.1 Determine the various performance parameters using vapour compression test rig.
2	1	Conventional Methods of Refrigeration-Ice refrigeration, Dry ice, Steam jet, Gas throttling, Liquid Gas, Air refrigeration, Vapour absorption, Vapour compression	LE-1.2 Identify the different refrigeration system and components in various application systems such as air conditioner, domestic refrigerator, water cooler etc.
3	1	Non conventional methods of refrigeration – Thermo electric, magnetic, Thermo acoustic, Pulse tube, Vortex tube.	
4	2	Concept of heat pump Refrigerating effect, Units of refrigeration, COP, Reversed Carnot cycle and its representation on PV and TS diagram	LE-1.3 Measure different operating parameters like pressure, temperature, humidity, velocity etc at different locations in a given system.
5	3	Air Refrigeration Cycles: Bell Coleman cycle - representation on PV and TS diagram, determination of COP, Application of the air refrigeration cycle such as Aircraft refrigeration. Simple numerical	LE-1.4 Perform performance test on heat pump.
6	3	Vapour Compression Cycle: Schematic diagram, representation on PV, TS and PH diagrams and its working. Actual VCC, calculation of COP, Effect of Wet /Dry – compression, superheating and Sub cooling, simple numerical Multistage vapour compression cycle- need and advantages, cascade refrigeration and its application.	
(CL-12,LI-3)			
(Approx. Hrs: CI+ LI =22)		Unit-2 Vapour compression and Vapour absorption refrigeration systems	
1	3	Construction and working of various components- Open type, hermetically sealed, Centrifugal, Screw type compressors, Application of the compressors.	LE2.1 Dismantle and assemble of Hermetic type of compressor to identify and sketch its different parts, their functions and specifications.
2	3	Evaporators- their functions and types such as extended surface, Plate coil type, Flooded, Dry Direct and Indirect expansion types Capacity	LE2.2 Determine performance



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		of evaporator. Frosting /defrosting of evaporators	parameters using vapour absorption test rig.
3	2	– types of condensers such as Evaporative type, Air cooled [forced and natural convection) Water cooled	LE2.3 Dismantle and assemble Reciprocating type of compressor to identify its different parts, sketch, their functions and specifications.
4	3	Construction and working of various types of expansion devices such as – capillary tube auto expansion and thermostatic expansion valves, solenoid control valves and Low side High side valve	LE2.4 Determine the parameters using a domestic refrigerator test rig.
5	4	Vapour Absorption System – Schematic diagram, principle, components and working of Ammonia vapour absorption system, Lithium Bromide absorption system, Electrolux Refrigerators , Comparison with vapor compression system	LE2.5 Determine the performance of various expansion devices on a refrigeration test rig. LE2.6 Identify the components of given condenser and evaporator.
		(CL-15,LI-7)	
		(Approx. Hrs: CI+ LI =13)	
		Unit-3 Refrigerants	
1	2	Refrigerants, Description, Function, Composition and its application, Thermodynamic properties and characteristics of ideal refrigerants	LE3.1 Determine the COP and refrigeration capacity of refrigerator using Freon-12, Freon-22, and Ammonia
2	1	Types of refrigerants as primary / secondary Properties of the Commonly used refrigerants such as – CO ₂ , Ammonia, SO ₂ , Freon 11, Freon 12 , Freon 22, Azeotropes, Azeotropic and Zeotropic blends.	LE3.2 Use leak detection method to detect the refrigerant leakage in a given setup.
3	1	Secondary Refrigerants, Properties of brines and glycols. Application of various brines, Inhibitor and other secondary refrigerants Environmental impact of different refrigerants	LE3.3 Identify refrigerant cylinders by color coding & standing pressure. LE3.4 Recover refrigerant from the given refrigeration system during maintenance work.
4	2	Nomenclature of refrigerant, Selection of refrigerants.	LE3.5 Charge refrigerant in a given system.
5	1	Next generation refrigerant, Alternatives of cfc's.	
6	1	Types of cylinder, color coding, refrigerant recovery method	
7	1	Safe practices in handling of refrigerants	
		(CL-9,LI-4)	
		(Approx. Hrs: CI+ LI =15)	
		Unit-4 Psychrometric	
1	1	Difference between refrigeration and air	LE4.1 Determine DBT, WBT of



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		conditioning, Necessity of air conditioning, Concept of body comfort	ambient air using sling Psychrometer.
2	3	Properties of air - DBT, WBT, Dew Point Temperature, Relative humidity, Sensible heat, Latent heat, Air as mixture of different gases and water vapour, Daltons law of partial pressure,	LE4.2 Use psychrometric chart to determine DBT, WBT, RH & other properties for given situations. LE4.3 Identify the different components of given Air Conditioning Test Rig
3	2	Concept of humidity of air, absolute humidity, relative Humidity, Psychrometers and their types, Enthalpy of air, Specific Volume of air, Dew Point Temperature of moist air.	LE4.4 Use air conditioning test rig to measure sensible heating, sensible cooling, humidification and dehumidification process.
4	4	Psychrometric charts, psychometric processes such as sensible heating and cooling, latent heating and cooling, heating and humidification, cooling and dehumidification, evaporative cooling, sensible heat factor, By-pass factor, apparatus dew point, simple numerical problems	LE4.5 Calculate refrigeration effect, work input, actual and theoretical COP, TOR and Plant efficiency of a given refrigerator.
(CL-10,LI-5)			
(Approx. Hrs: CI+LI = 15)		Unit-5 Air Conditioning and Cooling Load Calculation	
1	4	Air conditioning systems: Classification – Industrial, Comfort air conditioning, Summer, winter and year round air conditioning, Construction and working of window type, package type and central plant systems	LE5.1 Determine the cooling load of your class room. LE5.2 Estimate the cooling load due to solar heat gain in principal chamber of your institute.
2	6	Cooling load calculations: Sources of heat gain – External and internal source, solar radiation through windows, heat addition by occupants and equipments, infiltration of air – ventilation, Sensible heat load, Latent heat load, Total cooling load	LE5.3 Estimate the total heat load of your institute's workshop.
(CL-10,LI-5)			