LESSON PLAN

Name of Faculty	**Sh. Abhishek Yadav**
Discipline	Mechanical Engg.
Semester	4th
Subject	Materials and Metallurgy

Lesson Plan Duration : 15 Weeks

Work Load (Lecture/ Practical) : 03 Lectures/Week, **Practicals:** 02 Hours/Turn/Week

WEEK	THEORY		PRACTICAL	
	LECTURE DAY	TOPIC	PRACTICAL DAY	TOPIC
1st	1st	**UNIT-1.(1)Introduction:-**Material: Engineering materials,	1st	Classification of about 25 specimens of materials/ machine parts **(i)**Metals and non metals **(ii)** Metals and alloys (iii)Ferrous and non ferrous metals (iv)Ferrous and non ferrous alloys
	2nd	Overview of different engineering materials and applications,		
	3rd	Importance, Classification of materials, Difference between metals and non-metals		
2nd	4th	Overview of Biomaterials and semi conducting materials.	2nd	Given a set of specimen of metals and alloys (copper, brass, aluminium, cast iron HSS, Gun metal); identify and indicate the various properties possessed by them
	5th	**UNIT-II. (2) Crystallography** Fundamentals: Crystalline solid and amorphous solid,		
	6th	Unit Cell, Space Lattice		
3rd	7th	Arrangement of atoms in Simple Cubic Crystals, BCC, FCC and HCP Crystals	3rd	a) Study of heat treatment furnace.
	8th	Number of atoms per unit Cell,		
	9th	Atomic Packing Factor, coordination number (without derivation),		
4th	10th	Defects/ Imperfections, types and effects in Solid materials. Deformation: Overview of deformation behavior and its mechanisms,	4TH	b) Study of a thermocouple/pyrometer.
	11th	Elastic and Plastic deformation		
	12th	Failure Mechanisms: Overview of failure modes, fracture, fatigue and creep		
5th	13th	**SESSIONAL TEST**		
6th	14th	**UNIT-II. (3) <u>Metallurgy:</u>** Introduction, Cooling curve of pure metals, Dendritic solidification of metals, effect of grain size on mechanical properties,	6th	Study of a metallurgical microscope and a specimen polishing machine
	15th	Binary alloys, Thermal equilibrium diagrams,		
	16	Lever rule, Solid Solution alloys		
7th	17th	**UNIT-III. (4) <u>Metals And Alloys:</u> Ferrous Metals**: Different iron ores Flow diagram for production of iron and steel Allotropic forms of iron- Alpha, Delta, and Gamma.	7th	To prepare specimens of following materials for microscopic examination and to Examine the microstructure of the specimens of following materials• (At least any two) i) Brass ii) Copper iii) Cast Iron, iv) Mild Steel v) HSS, vi) Aluminium vii) Stainless steel
	18th	Basic process of manufacturing of pig iron, Basic process of steel-making, **Cast Iron:** Properties, types of Cast Iron, manufacture and their use.		
	19th	Steels: Plain carbon Steels and alloy steel, Classification of plain carbon steels, Properties and application of different types of Plain Carbon Steels, Effect of various alloying elements on properties of steel, uses of alloy steel (high speed steel, silicon steel, spring steel),		
8th	20th	**Stainless steel**: Definition, importance and criticality (Life cycle cost, Corrosion impact; difference with Steel, Per Capita consumption; growth rate of SS vs other materials, World vs India).	8th	Revision of previous practical

	21th	Various grades of SS and their nomenclature, Effect of alloying elements, Unique characteristics of various grades of SS		
	22th	**Manufacturing of SS**: Process flow, Raw materials for SS manufacturing functions of each processing unit, Downstream facilities, Various finishes of SS.		
9th	23th	**Fabrication and testing of SS**: Stud welding method, Weldability and effect of welding on various types of SS, Defects like Sensitization and microfissure, Relative observations and precautions while performing the processes: cutting , Buffing, Bending, Roll forming, Embossing, Polishing of Stainless steel.	9th	To anneal a given specimen and find out difference in hardness as a result of annealing.
	24th	Chemical treatment like pickling and passivation for SS, **Applications of SS** : Demand of SS in various segments,		
	25th	Overview of SS applications in Automobile, railway, and transport. Architectural, building construction applications and Process Industries. **Non Ferrous Materials** : properties and Uses of Copper, Aluminum and their alloys		
10th	26th	**SESSIONAL TEST**		
11th	27st	**UNIT-IV. Heat Treatment:** Definition and objectives of heat treatment, Iron carbon equilibrium diagram different microstructures of iron and steel	11th	To normalize a given specimen and to find out the difference in hardness as a result of normalizing
	28th	Formation and decomposition of Austenite, Martensitic Transformation. Various heat treatment processes- hardening, tempering		
	29th	Annealing, normalizing, Surface hardening ,carburizing, nitriding, cyaniding , hardenability of steels, Types of heat treatment Furnaces (only basic idea) Measurement of temperature of furnaces.		
12th	30th	**UNIT-6. (5) PLASTICS**: Importance of plastics, Classification Thermoplastic and thermoset, plastic and their uses, Various trade names of plastics, Plastic coatings	12th	To harden and temper a specimen and to find out the difference in hardness due to tempering.
	31th	Food grade plastics. Applications of plastics in automobile and domestic use. Rubber classification–Natural and synthetic. Selection of rubber wool, thermocole.		
	32th	Ceramics- Classification, properties, applications. Refractory materials–Dolomite, porcelain. Glass– Soda lime, borosil Abrasive materials,		
13th	33th	Joining materials / Adhesives–Classification, properties and applications	13th	Demo of welding defects like sensitization and microfissure in stainless steel.
	34th	Composites- Classification, properties, applications		
	35th	Materials for bearing metals,Materials for Nuclear, Energy, Smart materials-properties and applications		
14th	36	Revision	14th	Revision
	37	Revision		
	38	Revision		
15th		**SESSIONAL TEST**		

Lesson Planning

Name of Faculty **:Sh. Abhishek Yadav**
Dicipline **: Mechanical Engg.**
Subject **: Hydraulics and Pneumatics**
Lesson Plan duration **: 48 Hours**
Work load (Lecture/Practical) per week (in hours): 3L and 4P

Week	Theory		Practical
	Lecture day	Topic(Including assignment/test)	Topic
1	1	Introduction to Hydraulics and Pneumatics. Fluid, types of fluid	1. Measurement of pressure head by employing. i) Piezometer tube ii) Simple U-tube manometer
	2	properties of fluid viz mass density, weight density (specific weight), specific volume, capillarity	
	3	specific gravity, viscosity, compressibility, surface tension, kinematic viscosity and dynamic viscosity and their units.	
2	4	**Assignment-I**	2. Verification of Bernoulli's theorem.
	5	Simple numeric problems related to properties of fluids.	
	6	Pressure and its Measurement, Concept of pressure, Intensity of pressure	
3	7	static pressure and pressure head, Types of Pressure	3. Measurement of flow by using venturimeter..
	8	Pressure measuring devices: Manometers and Mechanical Gauges	
	9	Manometers: Piezometer, Simple U- tube Manometer, Micromanometer, Differential U-tube Manometer, Inverted U-tube, Manometers Construction, working and application , including simple numerical problems.	
4	10	Mechanical Gauges: Bourdon Tube pressure gauge, Diaphragm Pressure Gauge	4. To find out the value of coefficient of discharge for a venturimeter.
	11	Dead weight pressure gauge. Construction, working and application.	
	12	Statement of Pascal's law and its applications.	
5	13	**Sessional-I**	5. To find coefficient of friction for a pipe (Darcy's equation).
	14	Types of fluid flow – Steady and Unsteady, Uniform and Non-uniform, Laminar and Turbulent;	
	15	Rate of flow (Discharge) and its units; Continuity Equation of Flow; Hydraulic Energy of a flowing fluid	
6	16	Total head ; Bernoulli's Theorem statement (without proof) and its applications.	6. To study a single stage centrifugal pump and reciprocating pump for constructional details with the help of cut section
	17	**Assignment-II**	

	18	**PTM**	the help of cut section models.
7	19	Discharge measurement with the help of Venturimeter, Orifice meter, Pitot-tube,	7. Study the working of Pelton wheel, Francis and Kaplan turbine with the help of working model.
	20	limitations of Bernoulli's theorem , simple numerical problems on above topics.	
	21	Pipe and pipe flow, wetted perimeter, hydraulic mean depth, hydraulic gradient	
		loss of head due to friction; Chezy's equation and Darcy's equation of head loss (without proof),	
	22	Reynold's number and its effect on pipe friction; Water hammer.	8. Study of hydraulic circuit of any available machine or working model
	23	Simple numerical problems on pipe friction.	
	24	Nozzle - definition, velocity of liquid flowing through the nozzle, power developed.	
9	25	Description, operation and application of – hydraulic press, hydraulic jack,	9. Study of pneumatic circuit of any available machine or working model
	26	hydraulic accumulator, hydraulic brake ,	
	27	hydraulic ram, hydraulic door closer.	
10	28	**Sessional-II**	Revision
	29	Pumps and Water Turbines, Concept of hydraulic pump.	
	30	Classification of pumps.	
11	31	Construction, operation and application of Single acting reciprocating pump	Revision
	32	vane, screw and gear pumps.	
	33	**PTM**	
12	34	Construction, operation and application of centrifugal pump	
	35	Trouble shooting and problems in centrifugal pumps and remedial measures	
	36	pitting, cavitation, priming.	
13	37	Concept of a turbine, classification of turbines, types of turbines - impulse and reaction type (concept only), difference between them.	Revision
	38	**Assignment-III**	
	39	Construction and working of pelton wheel, Francis turbine and Kaplan turbines.	
	40	Introduction to oil power hydraulics and pneumatic system. Relative Merits and Demerits as oil power hydraulic and pneumatic system.	
	41	Industrial applications of oil power hydraulic and pneumatic system.	

	42	Basic components of hydraulic system, definition and functions of each component in a hydraulic circuit. Hydraulic oils- Classification and their properties. Seals and packing- classification of seals, sealing materials.	
15	43	Maintenance of hydraulic system: common faults in hydraulic system, simple visual checks of oil, causes of contamination, preventive measures.	Revision
	45	Basic Components of Pneumatic Systems , definition and functions of each component in a Pneumatic circuit. Necessity of Filter, Regulator and Regulator(FLR).	
16	46	Common problems in pneumatic systems. Maintenance schedule of pneumatic systems.	Revision
	47	Revision	
	48	Revision	

Lesson Planning

Name of Faculty :Mr. Gagan Kumar
Dicipline : Mechanical Engg.
Subject : Workshop Technology-III
Lesson Plan duration : 48 Hours
Work load (Lecture/Practical) per week (in hours): 3L

Week	Theory		Remarks
	Lecture day	Topic(Including assignment/test)	
1		**UNIT-01, Gear Manufacturing**	
	1	Gear materials and specifications,	
	2	Gear manufacturing by Casting, Moulding,Stamping,	
	3	Machining; Gear generating methods: Gear Shaping with pinion cutter	
2	4	& rack cutter;	
	5	Gear hobbing; Description of gear hob;	
	6	Operation of gear hobbing machine; Gear finishing processes;	
3		**UNIT-02 Grinding**	
	7	Purpose of grinding	
	8	Various elements of grinding wheel – Abrasive, Grade, structure, Bond	
	9	Common wheel shapes and types of wheel – built up wheels, mounted wheels and diamond wheels. Specification of grinding wheels as per BIS.	
4	10	**Sessional-I**	
	11	Truing, dressing, balancing and mounting of wheel.	
	12	**PTM**	
5	13	Grinding methods – Surface grinding, cylindrical grinding and centreless grinding.	
	14	Grinding machine – Cylindrical grinder, surface grinder,	
	15	internal grinder, centreless grinder,	
6	16	tool and cutter grinder.	
	17	Selection of grinding wheel	
	18	Revision	
7		**UNIT-03 Modern Machining Processes**	
	19	Mechanical Process - Ultrasonic machining (USM): Introduction, principle, process,	
	20	advantages and limitations, applications	
	21	Electro Chemical Processes - Electro chemical machining (ECM)	
6	22	Fundamental principle, process, applications,	
	23	Electro chemical Grinding (ECG) – Fundamental principle, process, application	
	24	**Sessional-II**	
9	25	Electrical Discharge Machining (EDM) - Introduction, basic EDM circuit, Principle, metal removing rate, dielectric fluid, applications	
	26	Laser beam machining (LBM) – Introduction, machining process and applications	
	27	**PTM**	
10	28	Electro beam machining (EBM)- Introduction, principle, process and applications	
		UNIT-04 Metal Forming Processes	
	29	Press Working - Types of presses, type of dies and punches, selection of press die, die material. Press	
	30	Operations-Shearing, piercing, trimming, punching, notching, shaving, gearing, embossing, stamping.	
11	31	Forging - Open die forging, closed die forging, Press forging, upset forging, swaging,	
	32	up setters, roll forging, Cold and hot forging.	
	33	Rolling - Elementary theory of rolling, Types of rolling mills, Thread rolling,	
12	34	roll passes, Rolling defects and remedies.	
	35	Extrusion and Drawing - Type of extrusion- Hot and Cold,	
	36	Direct and indirect.	

Lesson Planning

Name of Faculty :Mr. Gagan Kumar
Dicipline : Mechanical Engg.
Subject : Workshop Technology-III
Lesson Plan duration : 48 Hours
Work load (Lecture/Practical) per week (in hours): 3L

Week	Theory		Remarks
	Lecture day	Topic(Including assignment/test)	
13	37	Pipe drawing, tube drawing, wire drawing	
	38	Revision	
	39	Revision	
		UNIT-05 Metal Finishing Processes	
14	40	Purpose of finishing surfaces,Surface roughness-Definition and units	
	41	**Assignment-III**	
	42	Honing Process, its applications,Description of hones	
15	43	Brief idea of honing machines, Lapping process, its applications	
	44	Description of lapping compounds and tools,Brief idea of lapping machines.	
	45	Super finishing process, its applications,Polishing,Buffing	
		UNIT-06 Metallic Coating Processes	
16	46	Metal spraying – Wire process, powder coating process, applications,	
	47	Electroplating: Basic principles, Plating metals, applications; Hot dipping: Galvanizing, Tin coating, Parkerising,	
	48	Anodizing. Organic coatings: Oil base Paint, Lacquer base, Enamels, Bituminous paints, rubber base coating; Finishing specifications.	

Lesson Planning

Name of Faculty :Mr.Gagan Kumar
Dicipline : Mechanical Engg.
Subject : MACHINE DESIGN
Lesson Plan duration : 64 Hours
Work load (Lecture/Practical) per week (in hours): 4L

Week	Theory		Teacher sign	HOD sign
	Lecture day	Topic(Including assignment/test)		
1		**UNIT - 01 Introduction**		
		UNIT -1 INTRODUCTION		
	1	Design – Definition, Type of design, necessity of designComparison of designed and undesigned work		
	2	Design procedure and Characteristics of a good designer		
	3	Design terminology: stress, strain, factor of safety, factors affecting factor of safety, stress concentration, methods to reduce stress concentration, fatigue, endurance limit.		
	4	General design consideration and Codes and Standards (BIS standards		
2	5	Engineering materials and their mechanical properties		
	6	Properties of engineering materials: elasticity, plasticity, malleability, ductility, toughness		
	7	Introduction to Hardness and Resilience. Fatigue, creep, tenacity and strength etc.		
	8	Selection of materials, criteria of material selection		
3		**Assignment-1**		
		UNIT - 02 Design Failure		
	9	Various design failures-maximum stress theory, maximum strain theory		
	10	Classification of loads and Design under tensile, compressive and torsional loads.		
	11	Design under tensile, compressive and torsional loads.		
	12	Revision		
4	13	Revision		
		Sessional-I		
		UNIT-03 Design of Shaft		
	14	Type of shaft, shaft materials		
	15	Type of loading on shaft, standard sizes of shaft available		

	16	Shaft subjected to torsion only, determination of shaft diameter (hollow and solid shaft) on the basis of :		
5		**Assignment-II**		
	17	**Revision**		
		PTM		
	18	Determination of shaft diameter (hollow and solid shaft) on the basis of :		
	19	Determination of shaft diameter (hollow and solid shaft) subjected to bending		
	20	Determination of shaft diameter (hollow and solid shaft) subjected to combined torsion and bending		
6	21	Revision		
	22	Revision		
	23	**UNIT-04 Design of Key**		
	24	Types of key, materials of key, functions of key		
7	25	Failure of key (by Shearing and Crushing).		
	26	Design of key (Determination of key dimension)		
	27	Effect of keyway on shaft strength. (Figures and problems).		
	28	Failure of key (by Shearing and Crushing).		
8	29	Revision		
	30	Revision		
	31	**Sessional-II**		
	32	**UNIT -5 Design of Joints**		
9	33	Types of joints - Temporary and permanent joints, utility of various joints		
	34	Design of spigot and socket joint.		
	35	Knuckle Joints – Different parts of the joint, material used for the joint,		
	36	**PTM**		
10	37	Type of knuckle Joint, design of the knuckle joint. (Figures and problems).		
	38	Cotter Joint – Different parts of the spigot and socket joints		
	39	Design of spigot and socket joint.		
	40	Permanent Joint:		
11	41	Welded Joint - Welding symbols. Type of welded joint, strength of parallel and transverse fillet welds.		
	42	**Assignment-III**		
	43	Strength of combined parallel and transverse weld.		
	44	Riveted Joints. : Rivet materials, Rivet heads, leak proofing of riveted joint – caulking and fullering.		
12	45	Design of riveted joint – Lap and butt, single and multi riveted joint.		
	46	Revision		
	47	Revision		
	48	Revision		
13	49	**UNIT-6 Design of Flange Coupling**		
	50	Types of couplings, design of muff coupling, design of flange coupling. (both protected type and unprotected type).		
	51	Design of flange coupling. (both protected type and unprotected type).		
	52	Design of flange coupling. (both protected type and unprotected type		
14	53	Revision		
	54	Revision		
	55	**UNIT -7 Design of Screwed Joints**		
	56	Introduction, Advantages and Disadvantages of screw joints		
15	57	Initial stresses due to screw up forces, stresses due to combined forces		
	58	Design of power screws (Press, screw jack, screw clamp)		
	59	Important terms used in screw threads, designation of screw threads		
	60	Revision		
16	61	**Sessional-III**		
	62	Revision		
	63	Revision		
	64	Revision		

LESSON PLAN

NAME OF FACULTY : ABHISHEK BHARDWAJ
DISCIPLINE : MECHANICAL ENGINEERING - G.P. INDRI
SEMESTER : IV
SUBJECT : THERMODYNAMICS-II
LESSON PLAN DURATION : 12 WEEKS
WORK LOAD (LECTURE/PRACTICAL) PER WEEK : 3 LECTURES & 2 PRACTICALS

Week	Lecture	Theory	Practicals
	Day	Topic covered	
1st	1	**Unit-1 IC Engines** Introduction, Working principle of two stroke and four stroke cycle, SI engines and CI engines	Dismantle an IC engine and note down the condition of various parts, removal and fitting of piston, rings, measuring of bore size, crank shaft ovality and assemble it.
	2	Otto cycle, diesel cycle	
	3	dual cycle, Location and functions of various parts of IC engines and materials used for them	
2nd	4	**Unit-2 Fuel Supply and Ignition System in Petrol Engine**	Dismantle a carburetor
	5	Concept of carburetion, Air fuel ratio	
	6	Simple carburetor and its limitations and application.	
3rd	7	Description of battery coil and electro ignition system, fault finding/ and remedial action in ignition system	Servicing of petrol injection system
	8	Description of petrol injection system	
	9	**Unit-3 Fuel System of Diesel Engine,** Components of fuel system	
4th	10	Description and working of fuel feed pump	

	11	Fuel injection pump, Common rail direct injection (CRDI), Injectors	Valve servicing, grinding, lapping and fitting mechanism and tappet adjustment.
	12	**Unit-4 Cooling and Lubrication**	
5th	13	Function of cooling system in IC engine	
	14	Air cooling and water cooling system, use of thermostat and radiator.	Inspection of ignition system of a multi-cylinder engine stressing ignition timings, setting, fixing order and contact breaker; gap adjustment, spark plug cleaning.
	15	Function of lubrication, Types and properties of lubricant	
6th	16	Lubrication system of engine, Fault finding in cooling and lubrication and remedial action	Service of cooling & lubrication system of IC engine and note down the functioning/testing of various components.
	17	1st Sessional Test	
	18	**Unit-5 Testing of IC Engines**, Engine power - indicated and brake power	
7th	19	Efficiency - mechanical, thermal. relative and volumetric	
	20	Methods of finding indicated and brake power	Determination of BHP by dynamometer.
	21	Morse test for petro1 engine, Heat balance sheet,	
8th	22	Concept of pollutants in SI and CI engines, pollution control	
	23	norms for two or four wheelers - EURO - 1, EURO - 2, Bharat methods of reducing pollution in IC engines,	Morse test on multi-cylinder petrol engine.
	24	alternative fuels like CNG, LPG, Hydrogen	
9th	25	**Unit-6 Steam Turbines and Steam Condensers**	

	26	Function and use of steam turbine, Steam nozzles - types and applications	Draw layout of modern automobile workshop and note down the special tools and equipments in each shop
	27	Steam turbines - impulse, reaction, simple and compound, construction and working principle	
10th	28	2nd Sessional Test	
	29	Governing of steam turbines,Function of a steam condenser, elements of condensing plant	Local visit to roadways or private automobile workshop
	30	Classification - jet condenser, surface condenser, Cooling pond and cooling towers	
11th	31	**Unit-7 Gas Turbines and Jet Propulsion**, Classification, open cycle gas turbine and closed cycle gas turbine	
	32	comparison of gas turbines with reciprocating IC engines, applications and limitations of gas turbine	Copy Checking/revision
	33	Open cycle constant pressure gas turbines - general layout, PV and TS diagram and working of gas turbine	
		Closed cycle gas turbines, PV and TS diagram and working	
12th	34	Principle of operation of ram-jet engine and turbo jet engine	
		application of jet enginesRocket engine - its principle of working and applications	
	35	3rd Sessional Test	Viva-Voice
	36	Revision	

Lesson Plan

Name of Faculty : Sh. Abhishek Yadav
Dicipline : Mechanical Engg.
Subject : Computer Aided Drafting
Lesson Plan duration : 64 Hours
Work load (Lecture/Practical) per week (in hours): 4 Lab

Week	Lab	
		Topic(Including assignment/test)
1		**UNIT - 01 Introduction to Computer Aided Drafting (2D) commands of any one software**
	1	Concept of AutoCAD, Tool bars in CAD software, coordinate system,
	2	snap, grid, and ortho mode (Absolute, Relative and Polar),
	3	setting of units and layout. Drawing commands – point, line, arc, circle, ellipse,
2	4	Editing commands – scale, erase, copy, stretch, lengthen and explode.
	5	Dimensioning and placing text in drawing area,
	6	Sectioning and hatching,
3	7	Inquiry for different parameters of drawing entity
	8	Create layers within a drawing
4	9	Specifying Geometrical Dimensioning & tolerancing (GD&T) parameters in drawing
5		**UNIT- 02 Detail and assembly drawing of the following using Drafting Software (2D)**
	10	Plummer Block
	11	Wall Bracket
6	12	Stepped pulley, V-belt pulley
	13	Flanged coupling
7	14	Machine tool Holder (Three views)
	15	Screw jack, joints, crank shaft and piston.
8		**UNIT - 03 Isometric Drawing by CAD using any part modeling Software (3D)**
	16	Cone, Cylinder, Cube,Spring,
9	17	Spring, Isometric view of objects
10		**UNIT - 04 Introduction to any part modeling software.**
	18	Part modeling
	19	Creating reference planes
	20	Creating Extrude features Creating Revolve Creating Swept features,
11	21	Creating Loft features
	22	Creating Reference - points, axis, coordinates
	23	Creating curves
12	24	Creating Fillet features
	25	Inserting Hole types
	26	Creating Chamfer
	27	Creating Shell, Creating Rib
13	28	Environment& Utilities - Working with views and manipulating views.
	29	Create parts e.g. Piston, Pin, Bolts and Nuts, Fixture
	30	Jig parts, Washer,Rings, Gaskets, Machine parts etc.
14	31	Introduction to Assembly Modeling & Approaches – Top down and Bottom up approach,
	32	Applying Standard Mates- Coincident, Parallel, Perpendicular, Tangent Concentric,
	33	Lock, Distance, Angle. Assemble of any two Mechanism e.g.

15	34	Crank slider mechanism, Piston and Cylinder assembly,
	35	Quick Return Mechanism (QRM),
	36	Machine vices, Crank Shaft, Bearing assembly, any other mechanism.
	37	Revision
16	38	Revision
	39	Revision
	40	Revision