

3<sup>RD</sup> SEM, ME

LESSON PLAN FOR BASIC MECHANICAL ENGINEERING

Name of Teacher- Akshay Rana	Subject-Basic Mechanical Engineering	August-December 2024	Class- 3rd sem, ME
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S.NO.	WEEK	CONTENTS	REMARKS
1	Week 1	Introduction to Thermodynamics - Role of Thermodynamics in Engineering and science, Types of Systems, Thermodynamic Equilibrium, Properties, State, Process and Cycle,	
2	Week 2	Elementary introduction to Zeroth, First and Second laws of thermodynamics, Heat and Work Interactions for various processes; Concept of Heat Engine, Heat Pump & Refrigerator	
3	Week 3	Efficiency/COP; Kelvin-Planck and Clausius Statements, Carnot Cycle, Carnot Efficiency, T-S and P-V Diagrams, Concept of Entropy	
4	Week 4	Heat transfer & Thermal Power Plant: Heat Transfer, Modes of Heat Transfer; Conduction: Fourier Equation, Conduction heat transfer through Composite Walls, Simple Numerical Problems,,	
5	Week 5	Convection Heat transfer: : Natural and forced convection, Radiation: Absorption, Reflection and transmission of radiation	
6	Week 6	Concept of black body, Stefan-Boltzman Law (concept only , No derivation), Thermal Power Plant Layout; Rankine Cycle; Fire Tube and Water Tube boilers, Babcock& Wilcox, Cochran Boilers	
7	Week 7	Steam Turbines: Impulse and Reaction Turbines;	
8	Week 8	Condensers: Jet & Surface Condensers, Cooling Towers;	
9	Week 9	Internal Combustion Engines: Otto, Diesel and Dual cycles; P-V and T-S Diagrams; IC Engines:2-Stroke and 4-Stroke I.C. Engines, S.I. and C.I. Engines.	
10	Week 10	Materials and Manufacturing Processes ( derivations and Problems omitted): Engineering Materials, Classification and their Properties;	
11	Week 11	Metal Casting, Moulding, Patterns, Metal Working: Hot Working and Cold Working	
12	Week 12	Metal Forming: Extrusion, Forging, Rolling, Drawing, Gas Welding, Arc Welding, Soldering, and Brazing.	
13	Week 13	Machine Tools and Machining Processes: Machine Tools: Lathe Machine and types, Lathe Operations, Milling Machine and types, Milling Operations, Shaper and Planer Machines:	
14	Week 14	Differences, Quick Return Motion Mechanism , Drilling Machine: Operations, Grinding Machine: Operation	

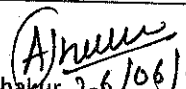
Akshay Rana  
 Sr. Lecturer (Mechanical Engg.)  
 Govt. Polytechnic Kinnaur


HOD/OIC

**LESSON PLAN FOR MANUFACTURING ENGINEERING**

Name of Teacher- <b>Abhay Thakur</b>	Subject- <b>Manufacturing Engineering</b>	August-December 2024	Class- 3rd sem, ME
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S.NO.	WEEK	CONTENTS	REMARKS
1	Week 1	Cutting Fluids & Lubricants: Introduction; Types of cutting fluids, Fluids and coolants required in turning, drilling, shaping, sawing & broaching; Selection of cutting fluids, methods of application of cutting fluid; Classification of lubricants(solid, liquid, gaseous), Properties and applications of lubricants.	
2	Week 2	Lathe Operations: Types of lathes – light duty, Medium duty and heavy duty geared lathe, CNC lathe (Concept only); Specifications; Basic parts and their functions; Operations and tools–Turning, parting off, Knurling, facing, Boring, drilling, threading, step turning, taper turning.	
3	Week 3	Broaching Machines: Introduction to broaching; Types of broaching machines–Horizontal type (Single ram & duplex ram), Vertical type, Pull up, pull down, and push down; Elements of broach tool; Nomenclature; Tool materials for broaching.	
4	Week 4	Drilling: Classification; Basic parts and their functions; Radial drilling machine; Types of operations; Specifications of drilling machine; Types of drills and reamers.	
5	Week 5	Welding: Classification; Gas welding techniques; Types of welding flames; Arc Welding –Principle, Equipment, Applications; Shielded metal arc welding; Submerged arc welding;	
6	Week 6	TIG / MIG welding; Resistance welding - Spot welding, Seam welding, Projection welding; Welding defects; Brazing and soldering.	
7	Week 7	Gear Making: Manufacture of gears–by Casting, Moulding, Stamping, Coining, Extruding, Rolling, Machining; Gear generating methods: Gear Shaping with pinion cutter & rack cutter; Gear hobbing;	
8	Week 8	Description of gear hob; Operation of gear hobbing machine; Gear finishing processes; Gear materials and specification; Heat treatment processes applied to gears.	
9	Week 9	Press working ( derivations and problems omitted): Types of presses and Specifications, Press working operations- Cutting, bending, drawing, punching, blanking, notching, lancing.	
10	Week 10	Die set components- punch and die shoe, guide pin, bolster plate, stripper, stock guide, feed stock, pilot; Punch and die clearances for blanking and piercing, effect of clearance.	
11	Week 11	Grinding and finishing processes: Principles of metal removal by Grinding; Abrasives –Natural & Artificial; Bonds and binding processes: Vittrified, silicate, shellac, rubber, bakelite; Factors affecting the selection of grind wheels:	
12	Week 12	Size and shape of wheel, kind of abrasive, grain size, grade and strength of bond, structure of grain, spacing, kinds of bind material; Grinding machines classification: Cylindrical, Surface, Tool & Cutter grinding machines; Construction details;	
13	Week 13	Principle of centerless grinding; Advantages & limitations of centerless grinding; Finishing by grinding: Honing, Lapping, Super finishing;	
14	Week 14	Electroplating: Basic principles, Plating metals, applications; Hot dipping: Galvanizing, Tin coating, Parkerising, Anodizing; Metal spraying: wire process, powder process and applications; Organic coatings; Finishing specifications.	

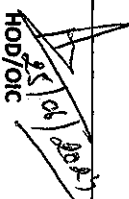
  
 Abhay Thakur 26/06/2024  
 Workshop Supdt. (Mechanical Engg.)  
 Govt. Polytechnic Kinnaur

  
 HOD/OIC

**LESSON PLAN FOR MEASUREMENT & METROLOGY**

Name of Teacher- Rohit Tiwari		Subject- Measurement & Metrology	August-December 2024	Class- 3rd sem, ME
S.NO.	WEEK	CONTENTS		REMARKS
1	Week 1	Introduction to measurements: Definition of measurement. Significance of measurement. Methods of measurements: Direct & Indirect. Generalized measuring system. Standards of measurements: Primary & Secondary		
2	Week 2	Factors Influencing selection of measuring instruments; Terms applicable to measuring instruments: Precision and Accuracy, Sensitivity and Repeatability, Range, Threshold, Hysteresis, calibration; Errors in Measurements: Classification of errors, Systematic and Random error		
3	Week 3	Measuring instruments: Introduction; Thread measurements: Thread gauge micrometer; Angle measurements: Bevel protractor, Sine Bar; Gauges: plain plug gauge, ring Gauge, snap gauge, Limit gauge.		
4	Week 4	Comparators: Characteristics of comparators, Types of comparators; Surface finish: Definition, Terminology of surface finish, Tay surf surface roughness tester; Coordinating measuring machine. Transducers and Strain gauges: Introduction; Transducers: Characteristics, classification of transducers, Strain Measurements		
5	Week 5	Strain gauge, Classification, mounting of strain gauges, Measurement of force, torque, and pressure (derivations omitted); Introduction; Force measurement: Spring Balance, Load cell		
6	Week 6	Torque measurement: Prony brake, Eddy current, Hydraulic dynamometer; Pressure measurement: McLeod gauge.		
7	Week 7	Applied mechanical measurements: Speed measurement: Classification of tachometers, Revolution counters, Eddy current tachometers; Displacement measurement: Linear variable Differential transformers (LVDT)		
8	Week 8	Flow measurement: Rotometers, Turbine meter; Temperature measurement: Resistance thermometers, Optical Pyrometer. Miscellaneous measurements: Humidity measurement: hair hygrometer		
9	Week 9	Density measurement: hydrometer; Liquid level measurement, sight glass, Float gauge. Limits, Fits & Tolerances: Concept of Limits, Fits, and Tolerances; Selective Assembly; Interchangeability; Hole And Shaft Basis System; Taylor's Principle CLASS		
10	Week 10	Angular Measurement: Concept; Instruments For Angular Measurements; Working and Use of Universal Bevel Protractor, Sine Bar, Spirit Level; Principle of Working of Clinometers; Angle Gauges.		
11	Week 11	Screw thread Measurements: ISO grade and fits of thread; Errors in threads; Measurement of different elements such as major diameter, minor diameter, effective diameter, pitch		
12	Week 12	Two wire method; Thread gauge micrometer; Working principle of floating carriage dial micrometer.		
13	Week 13	Gear Measurement and Testing: Analytical and functional inspection; Rolling test; Measurement of tooth thickness; Gear tooth Vernier; Errors in gears such as backlash, run out, composite.		
14	Week 14	Machine tool testing: Parallelism; Straightness; Squareness; Coaxiality; roundness; run out; alignment testing of machine tools as per IS standard procedure.		

Rohit Tiwari  
Lecturer (Mechanical Engg.)  
Govt. Polytechnic Kinnaur

  
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# GOVT POLYTECHNIC KINNAUR, CAMP AT ROHRU DISTT. Shimla (H.P)

## PLANNED SYLLABUS COVERAGE

SESSION - (Aug-DEC 2024)		Department : Mechanical Engineering		Faculty Name : Pankaj Chatanta	
SYLLABUS COVERAGE		Subject : Thermal Engineering I (3 <sup>rd</sup> Semester), ME		Designation: Lecturer Mechanical	
Sr. no		Topic/practical		No. of Pages: 3	
Week		Details of topic/practical		Practical Details	
1		Sources of Energy		Assignment details	
2		Sources of Energy		Remarks	
3		Internal Combustion Engines		Remarks	
1	Week 1	Sources of Energy	Brief description of energy Sources: Classification of energy sources: Renewable, Non-Renewable; Solar Energy: Flat plate and concentrating collectors & its applications (Solar Water Heater, Photovoltaic Cell); Wind Energy;	Flash & Fire point tests using Able's/Cleveland/Pensky Martin Apparatus	
2	Week 2	Sources of Energy	Tidal Energy; Ocean Thermal Energy; Geothermal Energy; Biogas, Biomass, Bio-diesel; Hydraulic Energy	Calorific value tests using bomb Calorimeter ( Solid and liquid fuels).	
3	Week 3	Internal Combustion Engines	Assumptions made in air standard cycle analysis; Brief description along with derivation of efficiency of Carnot, Otto and Diesel cycles with P-V and T-S diagrams; Internal and external combustion engines; classification of I.C. engines	Assembling and disassembling of I.C. Engines	

4	Week 4	Internal Combustion Engines	Function of each part and materials used for the component parts - Cylinder, crank case, crank pin, crank, crank shaft, connectingrod, wrist pin, piston, cylinder heads, exhaust valve, inlet valve	Assignment-I	Study of Port timing diagram of I.C engine(Petrol/ Diesel)	
5	Week 5	Internal Combustion Engines	Working of four-stroke and two-stroke petrol and diesel engines; Comparison of two stroke and four stroke engines		Study of Valve timing diagram of I.C engine(Petrol/ Diesel)	
6	Week 6	Internal Combustion Engines	Comparison of C.I. and S.I. engines; Valve timing and port timing diagrams for four stroke and two stroke engines.		Study of petrol and diesel engine components and Models	
7	Week 7	I.C. Engine Systems	Fuel system of Petrol engines; Principle of operation of simple carburetor; Fuel system of Diesel engines		Study of petrol and diesel engine components and Models	
8	Week 8	I.C. Engine Systems	Plunger type fuel injection pump, fuel feed pump and fuel injector ( description with line diagram)		Study of MPFI system.	
9	Week 9	I.C. Engine Systems	Cooling system ; Air cooling, water cooling system with thermosiphon method of circulation and water cooling system with radiator and forced circulation (description with line diagram). Comparison of air cooling and water cooling system	Assignment-II		
10	Week 10	I.C. Engine Systems	Ignition systems—Battery coil ignition and magneto ignition (description and working). Comparison of two systems; Types of lubricating systems used in I.C. engines with line diagram; Objective of		Study of MPFI system.	

11	Week 11	Performance of I.C. Engines	turbocharging and supercharging Brake power; Indicated power; Frictional power; Brake and Indicated mean effective pressures; Brake and Indicated thermal efficiencies	Study of Battery ignition system of multi cylinder petrol engine.	
12	Week 12	Performance of I.C. Engines	Mechanical efficiency; Relative efficiency; Performance test; Morse test; Heat balance sheet; Methods of determination of B.P., I.P. and F.P.; Simple numerical problems on performance of I.C. engines	Study of Cooling system of I.C. engine.	
13	Week 13	Air Compressors	House Test, Air Compressors: Functions of air compressor; Uses of compressed air;		
14	Week 14	Air Compressors	Types of air compressors; Single stage reciprocating air compressor - its construction and working (with line diagram) Multistage compressors-- Advantages over single stage compressors; Description of Rotary compressors, Centrifugal compressor, axial flow type compressor and vane type compressors.	Study of Lubrication system of I.C. engine.	

  
Signature of Teacher

  
Countersigned by HOD/ OIC

# GOVT POLYTECHNIC KINNAUR, CAMP AT ROHRU DIST. Shimla (H.P)

## PLANNED SYLLABUS COVERAGE

SESSION- AUG-DEC 2024		Department : Mechanical Engineering			Faculty Name : Pankaj Chatanta	
		Subject : MATERIAL SCIENCE & ENGINEERING, 3 <sup>rd</sup> SEM, ME			Designation: Lecturer Mechanical	
<b>SYLLABUS COVERAGE</b>		<b>Total Periods :- 56      Theory : 56</b>			<b>No. of Pages : 3</b>	
Sr. no	Week	Topic/practical	Details of topic/practical	Assignment details	Practical Details	Remarks
1	Week 1	Crystal structures and Bonds	Unit cell and space lattice: Crystal system: The seven basic crystal systems; Crystal structure for metallic elements: BCC, FCC and HCP; Coordination number for Simple Cubic, BCC and FCC			
2	Week 2	Crystal structures and Bonds	Atomic radius: definition, atomic radius for Simple Cubic, BCC and FCC (Formula for the above terms without Derivation); Atomic Packing Factor for Simple Cubic, BCC, FCC and HCP (derivations omitted)			
3	Week 3	Bonds in solids	Classification-primary or chemical bond, secondary or molecular bond; Concept of Types of primary bonds: Ionic, Covalent and Metallic Bonds.			

4	Week 4	Phase diagrams, Ferrous metals and its Alloys	Introduction of Isomorphs, eutectic and eutectoid systems; Iron-Carbon binary diagram; Iron and Carbon Steels; Iron ores-Pig Iron: classification, composition and effects of impurities on iron ; Cast Iron: classification, composition, properties and uses	Assignment-I		
5	Week 5	Phase diagrams, Ferrous metals and its Alloys	Wrought Iron: properties, uses/applications of wrought Iron; standard commercial grades of steel as per BIS and AISI; Alloy Steels – purpose of alloying; effects of alloying elements, Important alloy steels: Silicon steel, High Speed Steel(HSS), heat resisting steel, spring steel, Stainless Steel(SS)			
6	Week 6	Non-ferrous metals and its Alloys	Properties and uses of aluminum, copper, tin, lead, zinc, magnesium and nickel			
7	Week 7	Non-ferrous metals and its Alloys	Copper alloys: Brasses, bronzes – composition, properties and uses; Aluminum alloys: Duralumin, hindalium, magnelium – composition, properties and uses			
8	Week 8	Non-ferrous metals and its Alloys	Nickel alloys: Inconel, monel, nicrome – composition, properties and uses. Anti-friction/Bearing alloys: Various types of bearing, bronzes-Standard commercial grades as per BIS/SASME.			
9	Week 9	Failure analysis & Testing of Materials	Introduction to failure analysis; Fracture: ductile fracture, brittle fracture; cleavage; notch sensitivity; fatigue; concept of endurance limit; concept of creep; creep curve; creep fracture	Assignment-II		
10	Week 10	Failure analysis & Testing of Materials	Destructive testing: Tensile testing; compression testing; Hardness testing: Brinell, Rockwell; bend test; torsion test; fatigue test; creep test			



11	Week 11	Failure analysis & Testing of Materials,	Non-destructive testing: Visual Inspection; magnetic particle inspection; liquid penetrant test; ultrasonic inspection; radiography.			
12	Week 12	Corrosion & Surface Engineering	Nature of corrosion and its causes;;Electrolytes; Factors affecting corrosion: Environment, Material properties and physical conditions; Types of corrosion; Corrosion control: Material selection, environment control			
13	Week 13		<b>HOUSE TEST</b> , Surface engineering processes: Coatings and surface treatments			
14	Week 14	Corrosion & Surface Engineering	Cleaning and mechanical finishing of surfaces; Electroplating and Special metallic plating; Electro polishing and photo-etching;—Conversion coatings: Oxide, phosphate and chromate coatings; Thin film coatings: PVD and CVD; Hard-facing, thermal spraying and high-energy processes.			

  
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