

GOVERNMENT POLYTECHNIC PAONTA SAHIB
AT DHÁULA KUAN, DISTT. SIRMOUR(HP)-173031
DEPARTMENT OF MECHANICAL ENGINEERING
LESSON PLAN

Session : Aug.2026 - Dec. 2026
Branch: Mech. Engineering
Year/Semester : 2nd/ 3rd
Subject : Manufacturing Engineering

HOURS	Unit	Name of the chapter	Contents to be taught	Remarks
12 Hours	Unit-I	Cutting Fluids & Lubricants	Introduction; Types of cutting fluids, Fluids and coolants required in turning, drilling, shaping, sawing & broaching;	
		Lathe Operations	Selection of cutting fluids, methods of application of cutting fluid; Classification of lubricants(solid, liquid, gaseous), Properties and applications of lubricants.	
			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.	
10 Hours	Unit-II	Broaching Machines	Introduction to broaching; Types of broaching machines–Horizontal type (Single ram & duplex ram), Vertical type, Pull up, pull down, and push down;	
		Drilling	Elements of broach tool; Nomenclature; Tool materials for broaching. Classification; Basic parts and their functions; Radial drilling machine; Types of operations; Specifications of drilling machine; Types of drills and reamers	
12 Hours	Unit-III	Welding	Classification; Gas welding techniques; Types of welding flames; Arc Welding –Principle, Equipment, Applications; Shielded metal arc welding; Submerged arc welding;	
		Milling	TIG / MIG welding; Resistance welding - Spot welding, Seam welding, Projection welding; Welding defects; Brazing and soldering. Introduction; Types of milling machines: plain, Universal, vertical; constructional details & specifications. Milling operations: simple, compound and differential indexing (No Numerical); Milling cutters –types; Teeth materials; Tool signature in ASA; Tool & work holding devices.	
12 Hours	Unit-IV	Gear Making	Manufacture of gears–by Casting, Moulding, Stamping, Coining, Extruding, Rolling, Machining;	
		Gear Making	Gear generating methods: Gear Shaping with pinion cutter & rack cutter; Gear hobbing; Description of gear hob; Operation of gear hobbing machine; Gear finishing processes; Gear materials and specification; Heat treatment processes applied to gears	
		Press working (derivations and problems omitted)	Types of presses and Specifications, Press working operations- Cutting, bending, drawing, punching, blanking, notching, lancing. 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. Principles of metal removal by Grinding; Abrasives –Natural & Artificial; Bonds and binding processes: Vitrified, silicate, shellac, rubber, bakelite;	
10 Hours	Unit-V	Grinding and finishing processes	Factors affecting the selection of grind wheels: 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; Principle of centerless grinding; Advantages & limitations of centerless grinding; Finishing by grinding; Honing, Lapping, Super finishing; Electroplating; Basic principles	

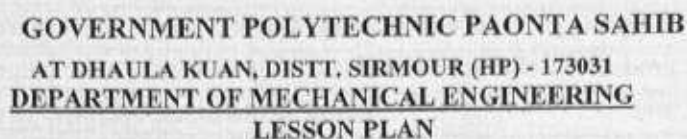

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 Branch: Mech. Engineering
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			Types of lathes – light duty, Medium duty and heavy duty geared lathe, CNC lathe (Concept only); Specifications; Basic parts and their functions;	
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12 Hours	Unit-III	Welding	Classification; Gas welding techniques; Types of welding flames; Arc Welding – Principle, Equipment, Applications; Shielded metal arc welding; Submerged arc welding;	
		Milling	TIG / MIG welding; Resistance welding - Spot welding, Seam welding, Projection welding; Welding defects; Brazing and soldering.	
12 Hours	Unit-IV	Gear Making	Introduction; Types of milling machines: plain, Universal, vertical; constructional details & specifications.	
			Milling operations: simple, compound and differential indexing (No Numerical); Milling cutters –types; Teeth materials; Tool signature in ASA; Tool & work holding devices.	
		Press working (derivations and problems omitted)	Manufacture of gears–by Casting, Moulding, Stamping, Coining, Extruding, Rolling, Machining;	
			Gear generating methods: Gear Shaping with pinion cutter & rack cutter; Gear hobbing; Description of gear hob; Operation of gear hobbing machine; Gear finishing processes;	
10 Hours	Unit-V	Grinding and finishing processes	Gear materials and specification; Heat treatment processes applied to gears	
			Types of presses and Specifications, Press working operations- Cutting, bending, drawing, punching, blanking, notching, lancing.	
			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, Principles of metal removal by Grinding; Abrasives –Natural & Artificial; Bonds and binding processes; Vitrified, silicate, shellac, rubber, bakelite;	
			Factors affecting the selection of grind wheels: 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; Principle of centerless grinding; Advantages & limitations of centerless grinding;	
			Finishing by grinding: Honing, Lapping, Super finishing; Electroplating; Basic principles	

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Academic Year	AUG - DEC 2026
Semester	THIRD
Course Code	MEP203
Course Name	MATERIAL SCIENCE & ENGINEERING
Course Type	PROGRAMME CORE COURSE (PC)
L-T-P	3-1-0
Name of Faculty	SANJEEV KUMAR SHARMA
Semester Start & End Dates	01-08-2026

STUDY AND EVALUATION SCHEME

Sr. No.	Name of the Subject	Th.	Des	Pr.	Internal Assessment			External Assessment					Total Marks
					Th.	Pr.	Total	Th.	Hrs.	Pr.	Hrs.	Total	
1	MATERIAL SCIENCE & ENGINEERING	3	1	0	40	0	40	60	3	0	3	100	100

Hour s	Unit & Topic of Discussion	Topic Details	Delivery Method
	Unit1: Crystal structures and Bonds:		Chalk & Blackbo ard And Projector
1Hr	Unit cell and space lattice		
1Hr	Crystal system: The seven basic crystal systems		
1Hr	Crystal structure and coordination no. for metallic elements: Simple cubic		
1Hr	Crystal structure and coordination no. for metallic elements: BCC		
1Hr	Crystal structure and coordination no. for metallic elements: FCC		
1Hr	Crystal structure and coordination no. for metallic elements: HCP		
1Hr	Atomic radius and atomic packing factor for Simple Cubic		Chalk & Blackbo ard And Projector
1Hr	Atomic radius and atomic packing factor for BCC		
1Hr	Atomic radius and atomic packing factor for FCC		
1Hr	number of atoms for a unit cell		
1Hr	Classification-primary or chemical bond, secondary or molecular bond		
1Hr	Concept of Types of primary bonds: Ionic, Covalent and Metallic Bonds		
	Unit-II:Phase diagrams, Ferrous metals and its Alloys:		
1Hr	Isomorphs, eutectic and eutectoid systems		

1Hr	Iron-Carbon binary diagram; Iron and Carbon Steels	Chalk & Blackboard And Projector
1Hr	flow sheet for production of iron and steel	
1Hr	Iron ores-Pig iron	
1Hr	Classification, composition and effects of impurities on iron	
1Hr	Cast Iron: classification, composition, properties and uses;	
1Hr	Wrought Iron: properties, uses/applications of wrought Iron	Chalk & Blackboard And Projector
1Hr	Comparison of cast iron, wrought iron and mild steel and high carbon steel	
1Hr	Standard commercial grades of steel as per BIS and AISI	
1Hr	Alloy Steels – purpose of alloying; effects of alloying elements	
1Hr	Important alloy steels: Silicon steel	
1Hr	High Speed Steel(HSS), heat resisting steel	Chalk & Blackboard And Projector
1Hr	Stainless Steel(SS): types of SS	
1Hr	Applications of SS-magnet steel- composition, properties and useS	
	UNIT-III	
	Non-ferrous metals and its Alloys	
1Hr	Properties and uses of aluminum, copper	
1Hr	Properties and uses of tin, lead, zinc, magnesium and nickel	
1Hr	Properties and uses of magnesium and nickel	Chalk & Blackboard And Projector
1Hr	Copper alloys: Brasses - composition, properties and uses	
1Hr	Copper alloys: bronzes – composition, properties and uses	
1Hr	Aluminum alloys: Duralumin – composition, properties and uses	
1Hr	Aluminum alloys: Hindalium, magnelium – composition, properties and uses	
1Hr	Nickel alloys: Inconel, monel, nicrome – composition, properties and uses	
1Hr	Anti-friction/Bearing alloys: Various types of bearing	
1Hr	bronzes-Standard commercial grades as per BIS/ASME	
	Unit-IV: Failure analysis & Testing of Materials:	
1Hr	Introduction to failure analysis; Fracture	
1Hr	Fracture: ductile fracture	
1Hr	Brittle fracture	
1Hr	Cleavage; notch sensitivity	Chalk & Blackboard And Projector
1Hr	Fatigue; endurance limit	
1Hr	Creep; creep curve; creep fracture	
1Hr	Destructive testing: Tensile testing; compression testing	
1Hr	Hardness testing: Brinell, Rockwell; bend test; torsion test; fatigue test; creep test	
1Hr	Non-destructive testing: Visual Inspection	
1Hr	Magnetic particle inspection; liquid penetrant test; ultrasonic inspection; radiography	
	Corrosion & Surface Engineering:	
1Hr	Nature of corrosion and its causes	
1Hr	Electrolytes	
1Hr	Factors affecting corrosion: Environment, Material properties and physical conditions	
1Hr	Types of corrosion ,Corrosion control: Material selection, environment control;	

Chalk & Blackboard And Projector

1Hr	Surface engineering processes: Coatings and surface treatments	Chalk & Blackboard And Projector
1Hr	Cleaning and mechanical finishing of surfaces	
1Hr	Electroplating and Special metallic plating	
1Hr	Electro polishing and photo-etching;	
1Hr	Conversion coatings: Oxide, phosphate and chromate coatings	
1Hr	Thin film coatings: PVD and CVD	
1Hr	Hard-facing, thermal spraying and high-energy processes	

	Name of Book	Author Name	Publication
Prescribed Books	A Text Book of Material Science & Metallurgy	O.P. Khanna	Dhanpath Rai and Sons, New Delhi, 2003
	Material Science & Engineering	R.K. Rajput	S.K. Kataria & Sons, New Delhi, 2004.
	Material Science	R.S. Khurmi	, S.Chand & Co. Ltd., New Delhi, 2005.

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Signature of Head of Department

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AT DHAULA KUAN, DIST. SIRMOUR (HP) - 173031
DEPARTMENT OF MECHANICAL ENGINEERING

LESSON PLAN

r	AUG- DEC 2026
	THIRD
	MEPC201
	BASIC MECHANICAL ENGINEERING
	PROGRAMME CORE
	MECHANICAL ENGINEERING
	3-0-1
lty	ER. MUNEESESH KUMAR
t & End Dates	01-08-2026 TO 28-11-2026

D EVALUATION SCHEME

f the Subject	Hours/Weeks			Total hours/ week	Credits	Internal Assessment			External Assessment			
	L	P	DCS			Th.	Pr	Total	Th.	Hrs.	Pr.	Hrs.
MECHANICAL EERING	3	0	1	4	3	40		40	60	3		

Topic Details	Delivery M
ction to Thermodynamics	
modynamics and its role in Engineering and science	
s of Systems, Thermodynamic Equilibrium	
erties, State, Process and Cycle, Zeroth Law of Thermodynamics	
and Second laws of thermodynamics	
and Work Interactions for various processes	
ept of Heat Engine, Heat Pump & Refrigerator, Efficiency/COP	
n-Planck & Clausius Statement	
ot Cycle	
& PV Diagram, Entropy	
ansfer & Thermal Power Plant	
duction to Heat Transfer	
es of Heat Transfer-Conduction, convection and radiation	
ier Equation, Stefan-Boltzman Law	
erical Problems	
ut of Thermal Power plant layout	
ine Cycle	

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Day 17	Types of Boiler
Unit-3 : Steam Turbines and Internal Combustion Engines	
Day 18	Steam Turbines
Day 19	Impulse and Reaction Turbines
Day 20-21	Condensers, Jet Condensers
Day 22-23	Surface condensers
Day 24	Cooling towers
Day 25	Internal Combustion Engines,
Day 26	Otto Cycle
Day 27	Diesel Cycle
Day 28	Dual Cycle
Day 29	2-Stroke and 4-Stroke I.C. Engines
Day 30	S.I. and C.I. Engines
Unit-4 : Materials and Manufacturing Processes	
Day 31	Engineering Materials
Day 32	Classification of Engineering Materials
Day 33	Properties of Engineering Materials
Day 34-35	Manufacturing Processes- Metal Casting, Moulding, Patterns
Day 36-39	Manufacturing Processes- Metal Working: Hot Working and Cold Working, Metal Forming: Extrusion, Forging, Rolling, Drawing
Day 40	Gas Welding
Day 41-42	Arc Welding
Day 43	Soldering and Brazing
Unit 5 : Machine Tools and Machining Processes	
Day 44-45	Lathe Machine and its types, Lathe Operations
Day 46-47	Milling Machine and its types, Milling operations
Day 48	Difference between Shaper and Planer Machines, Quick Return Motion Mechanism.
Day 49	Drilling Machine and its operations
Day 50	Grinding Machine and its operations.
Day 51-56	Revision

	Name of Book	Author Name	Publication
Prescribed Books	1. Basic Mechanical Engineering	M.P.Poonia & S.C. Sharma	Khanna Publishing House
	2. Elements of Mechanical Engineering	M.L. Mathur, F.S.Mehta and R.P. Tiwari	Jain Brothers


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DEPARTMENT OF MECHANICAL ENGINEERING
LESSON PLAN

Academic Year	AUG - DEC 2026
Semester	THIRD
Course Code	MEPC205
Course Name	MEASUREMENT & METROLOGY
Course Type	PROGRAMME CORE
L-T-P	3-1-0
Name of Faculty	ER. MUNEESH KUMAR
Semester Start & End Dates	01-08-2026 TO 28-11-2026

STUDY AND EVALUATION SCHEME

S.No	Name of the Subject	Th	DCS	Pr	Internal Assessment			External Assessment					Total Marks
					Th	Pr	Total	Th	Hrs	Pr	Hrs	Total	
1.	MEASUREMENT & METROLOGY	3	1	0	40	0	40	60	3	0	0	60	100
2.	MEASUREMENT & METROLOGY LAB	0	0	2	0	40	40	0	0	60	3	60	100

HOURS	Unit & Topic of Discussion	Topic Details	Delivery Method
	Unit-1(a) : Introduction to measurements		
	Introduction (L1,L2,L3,L4,L5)	Definition of measurement; Significance of measurement; Methods of measurements: Direct & Indirect; Generalized measuring system; Standards of measurements: Primary & Secondary; Factors influencing selection of measuring instruments	
	Terms applicable to measuring instruments (L6,L7,L8)	Precision and Accuracy, Sensitivity and Repeatability, Range, Threshold, Hysteresis, calibration; Errors in Measurements: Classification of errors, Systematic and Random error.(introduction only)	
17 HOURS	(b): Measuring instruments		
	Introduction(L9)		
	Thread measurements(L10)	Thread gauge micrometer	
	Angle measurements (L11,L12)	Bevel protractor, Sine Bar	
	Gauges (L13)	plain plug gauge, ring Gauge, snap gauge, limit gauge	
	Comparators (L14)	Characteristics of comparators, Types of comparators	
	Surface finish (L15,L16)	Definition, Terminology of surface finish, Taly surf surface roughness tester	
	Miscellaneous (L17)	Coordinating measuring machine	
	Unit-2(a) : Transducers and Strain gauges		
	Introduction (L18,L19)	Transducers: Characteristics, classification of transducers	
	Strain Measurements (L20, L21)	Strain gauge, Classification, mounting of strain gauges, (Theoretical aspects)	
	(b) : Measurement of force, torque, and pressure		
10	Introduction (L22)		

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HOURS	Force measurement (L23,L24)	Spring Balance , Load cell
	Torque measurement(L25,L26)	Prony brake, Eddy current, Hydraulic dynamometer
	Pressure measurement (L27)	McLeod gauge
Unit 3 (a): Applied mechanical measurements		
8 HOURS	Speed measurement(L28,L29)	Classification of tachometers, Revolution counters, Eddy current tachometers
	Displacement measurement(L30)	Linear variable Differential transformers (LVDT)
	Flow measurement (L31)	Rotometers, Turbine meter
	Temperature measurement (L22)	Resistance thermometers, Optical Pyrometer
	(b) Miscellaneous measurement	
	Humidity measurement (L33)	hair hygrometer
	Density measurement (L34)	hydrometer
	Liquid level measurement (L35)	sight glass, Float gauge
Unit 4 (a): Limits, Fits & Tolerances		
13 HOURS	(L36,L37,L38)	Concept of Limits, Fits, and Tolerances; Selective Assembly; Interchangeability; Hole And Shaft Basis System; Taylor's Principle
	(b): Angular Measurement	
	Concept (L39)	Instruments For Angular Measurements; Working and Use
	Instruments principle and working (L40,L41,L42)	Working and Use of Universal Bevel Protractor, Sine Bar, Spirit Level; Principle of Working of Clinometers; Angle Gauges
	(c): Screw thread Measurements	
	Introduction (L43)	ISO grade and fits of thread; Errors in threads
	Measurement of different elements(L44,L45)	major diameter, minor diameter, effective diameter, pitch
	Methods of measurement (L46,L47,L48)	Two wire method; Thread gauge micrometer; Working principle of floating carriage dial micrometer.
Unit 5 (a): Gear Measurement and Testing		
8 HOURS	(L49,L50,L51,L52)	Analytical and functional inspection; Rolling test; Measurement of tooth thickness; Gear tooth Vernier; Errors in gears such as backlash, run out, composite
	(b): Machine tool testing	
	Concept (L53,L54,L55,L56)	Parallelism; Straightness; Squareness; Coaxiality; roundness; run out; alignment testing of machine tools as per IS standard procedure.

	Name of Book	Author Name	Publication
Prescribed Books	Engineering Metrology	R.K.Jain	Khanna Publishers, NewDelhi,2005
	Engineering Metrology	K.J.Hume	Kalyani publishers

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DEPARTMENT OF MECHANICAL ENGINEERING

LESSON PLAN

Academic Year	AUG - DEC 2026
Semester	THIRD
Course Code	MEPC209
Course Name	THERMAL ENGINEERING-I
Course Type	PROGRAMME CORE
L-T-P	3-1-0
Name of Faculty	ER. MUNEESH KUMAR
Semester Start & End Dates	01-08-2026 TO 28-11-2026

STUDY AND EVALUATION SCHEME

Sr. No.	Name of the Subject	Th	DCS	Pr	Internal Assessment			External Assessment					Total Marks
					Th	Pr	Total	Th	Hrs	Pr	Hrs	Total	
1.	THERMAL ENGINEERING-I	3	1	0	40	0	40	60	3	0	0	60	100

HOURS	Unit & Topic of Discussion	Topic Details	Delivery Method
9 HOURS	Unit-1 : Sources of Energy		
	Brief description of energy Sources	Conventional as well as non-conventional	
	Classification of energy sources	Renewable, Non-Renewable	
	Solar Energy	Solar thermal (SWH) and solar photovoltaic	
	Solar collectors	Flat plate and concentrating collectors & its applications	
	Solar Derived energies	Wind Energy; Tidal Energy; Ocean Thermal Energy; Geothermal Energy;	
	Miscellaneous	Biogas, Biomass, Bio-diesel; Hydraulic Energy	
11 HOURS	Unit-2: Internal Combustion Engines		
	Introduction to 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; Function of each part and materials used for the component parts - Cylinder, crank case, crank pin, crank, crank shaft, connecting rod, wrist pin, piston, cylinder heads, exhaust valve, inlet valve	
	Working of four-stroke and two-stroke petrol and diesel engines	Comparison of two stroke and four stroke engines; Comparison of C.I. and S.I. engines; Valve timing and port timing diagrams for four stroke and two stroke engines.	
	Unit-3 : I.C. Engine Systems		
	Fuel system of Petrol engines	Principle of operation of simple carburetor	
	Fuel system of Diesel engines	Plunger type fuel injection pump, fuel feed pump and fuel	



12 OURS		injector (description with line diagram)
	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
	Ignition systems	Battery coil ignition and magneto ignition (description and working). Comparison of two systems
	Lubrication Systems	Types of lubricating systems used in I.C. engines with line diagram
	Miscellaneous	Objective of turbocharging and supercharging

Unit-4 : Performance of I.C. Engines

11 OURS	Engine Parameters	Brake power; Indicated power; Frictional power; Brake and Indicated mean effective pressures; Brake and Indicated thermal efficiencies; Mechanical efficiency; Relative efficiency
	Engine 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

Unit 5 (a): Air Compressors

14 OURS	Air Compression	Functions of air compressor; Uses of compressed air
	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

(b) Refrigeration & Air-conditioning (Problems omitted)

14 OURS	Refrigeration	Refrigerant; COP; Air Refrigeration system: components, working & applications
	Vapor Compression system	components, working & applications
	Air conditioning	Classification of Air-conditioning systems; Window Air Conditioner; Summer Air-Conditioning system, Winter Air-Conditioning system, Year-round Air Conditioning system, Central air conditioning system

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	Name of Book	Author Name	Publication
described books	Thermal Engineering	P.L. Ballaney	Khanna Publishers,2002
	Introduction to Renewable Energy	Vaughn Nelson	CRC Press

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