



**GOVERNMENT POLYTECHNIC PAONTA
SAHIB**

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

LESSON PLAN

Academic Year	AUG - DEC 2023
Semester	THIRD
Course Code	MEPC201
Course Name	BASIC MECHANICAL ENGINEERING
Course Type	PROGRAMME CORE
L-DCS-P	3-1-0
Name of Faculty	NITISH SHARMA
Semester Start & End Dates	10-08-2023 TO 04-12-2023

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.	BASIC MECHANICAL ENGINEERING	3	1	0	40	0	40	60	3	0	0	60	100

HOURS	Unit & Topic of Discussion	Topic Details	Delivery Method
	Unit-1 : Introduction to Thermodynamics		
12 HOURS	Introduction to Thermodynamics	Role of Thermodynamics in Engineering and science, Types of Systems, Thermodynamic Equilibrium, Properties, State, Process and Cycle, Elementary introduction to Zeroth, First and Second laws of thermodynamics	
	Heat and Work	Heat and Work Interactions for various processes; Concept of Heat Engine, Heat Pump & Refrigerator, Efficiency/COP Kelvin-Planck & Clausius Statement, Carnot Cycle, T-S & PV Diagram, Entropy	

		Unit-2 : Heat transfer & Thermal Power Plant		CHALK- BLACKBOARD & USING TECHNOLOGICAL PADA GOGY
12 HOURS	Heat Transfer	Heat Transfer, Modes of Heat Transfer- Conduction, convection and radiation, Fourier Equation, Stefan-Boltzman Law Different conditions and numerical problems.		
	Thermal Power Plant	Layout, Rankine Cycle, Types of Boiler.		
		Unit-3 : Steam Turbines and Internal Combustion Engines		
11 HOURS	Steam Turbines	Impulse and Reaction Turbines		
	Condensers	Jet & Surface Condensers, Cooling Towers		
	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.		
		Unit-4 : Materials and Manufacturing Processes (derivations and Problems omitted)		
11 HOURS	Engineering Materials	Classification and their Properties		
	Manufacturing Processes	Metal Casting, Moulding, Patterns, Metal Working: Hot Working and Cold Working, Metal Forming: Extrusion, Forging, Rolling, Drawing, Gas Welding, Arc Welding, Soldering, and Brazing		
		Unit 5 : Machine Tools and Machining Processes		
11 HOURS	Lathe Machine	Types, Lathe Operations		
	Milling Machine	Types, Milling Operations		
	Shaper and Planer Machines	Differences, Quick Return Motion Mechanism		
	Drilling Machine and Grinding Machine	Operations of Drilling and Grinding Machines		

	Name of Book	Author Name	Publication
Prescribed Books	Basic Mechanical Engineering	M.P.Poonia & S.C. Sharma	Khanna Publishing House
	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 2023
Semester	THIRD
Course Code	MEPC203
Course Name	MATERIAL SCIENCE AND ENGINEERING
Course Type	PROGRAMME CORE
L-DCS-P	3-1-0
Name of Faculty	NITISH SHARMA
Semester Start & End Dates	10-08-2023 TO 04-12-2023

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:	MATERIAL SCIENCE AND ENGINEERING	3	1	0	40	0	40	60	3	0	0	60	100

HOURS	Unit & Topic of Discussion	Topic Details	Delivery Method
	Unit-1 : Crystal structures and Bonds		
13 HOURS	Unit cell and space lattice: Crystal system	The seven basic crystal systems; Crystal structure for metallic elements: BCC, FCC and HCP	
	Coordination number	Coordination number for Simple Cubic, BCC and FCC	
	Atomic radius	Atomic radius for Simple Cubic, BCC and FCC	
	Atomic Packing Factor	Atomic Packing Factor for Simple Cubic, BCC, FCC and HCP	
	Bonds in solids	Classification, Concept of Types of primary bonds	

Unit-2 : Phase diagrams, Ferrous metals and its Alloys		
13 HOURS	Introduction	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; 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)
Unit-3 : Non-ferrous metals and its Alloys		
11 HOURS	Aluminium	Properties and uses of aluminum
	Copper, tin, lead, zinc, magnesium and nickel	Copper alloys: Brasses, bronzes - composition, properties and uses; Aluminum alloys: Duralumin, hinalium, magnelium - composition, properties and uses; Nickel alloys: Inconel, monel, nicrome - composition, properties and uses.
	Anti-friction/Bearing alloys	Various types of bearing, bronzes-Standard commercial grades as per BIS/ASME
Unit-4 : Failure analysis & Testing of Materials		
11 HOURS	Introduction to failure analysis	Fracture: ductile fracture, brittle fracture; cleavage; notch sensitivity; fatigue; concept of endurance limit; concept of creep; creep curve; creep fracture
	Destructive testing	Tensile testing; compression testing; Hardness testing: Brinell, Rockwell; bend test; torsion test; fatigue test; creep test
	Non-destructive testing	Visual Inspection; magnetic particle inspection; liquid penetrant test; ultrasonic inspection; radiography
Unit 5 : Corrosion & Surface Engineering		
8 HOURS	Corrosion	Nature of corrosion and its causes, Factors affecting corrosion, Types of corrosion; Corrosion control: Material selection, environment control.
	Surface engineering processes	Coatings and surface treatments; Cleaning and mechanical finishing of surfaces; Electroplating and Special metallic plating; Electro polishing and photo-etching;-Conversion coatings:

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Oxide, phosphate and chromate coatings; Thin film coatings: PVD and CVD; 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,
	Material Science & Engineering	R.K. Rajput	S.K. Kataria & Sons



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DEPARTMENT OF MECHANICAL ENGINEERING

LESSON PLAN

Academic Session	AUG - DEC 2023
Semester	THIRD
Course Code	MEPC205
Course Name	MEASUREMENT & METROLOGY
Course Type	PROGRAMME CORE
L-T-P	3-1-0
Name of Faculty	MUNEESH KUMAR
Semester Start & End Dates	10-08-2023 TO 04-12-2023

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	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	Precision and Accuracy, Sensitivity and Repeatability, Range, Threshold, Hysteresis, calibration; Errors in Measurements: Classification of errors, Systematic and Random error.(introduction only)	
12 HOURS	(b): Measuring instruments		
	Introduction		
	Thread measurements	Thread gauge micrometer	
	Angle measurements	Bevel protractor, Sine Bar	
	Gauges	plain plug gauge, ring Gauge, snap gauge, limit gauge	
	Comparators	Characteristics of comparators, Types of comparators	
	Surface finish	Definition, Terminology of surface finish, Taly surf surface roughness tester	
	Miscellaneous	Coordinating measuring machine	
	Unit-2(a) : Transducers and Strain gauges		
	Introduction	Transducers: Characteristics, classification of transducers	
	Strain Measurements	Strain gauge, Classification, mounting of strain gauges, (Theoretical aspects)	
10 HOURS	(b) : Measurement of force, torque, and pressure		
	Introduction		

	Force measurement	Spring Balance , Load cell	CHALK- BLACKB OARD & USING TECHNO LOGICAL PADAGO GY
	Torque measurement	Prony brake, Eddy current, Hydraulic dynamometer	
	Pressure measurement	Mcloed gauge	
	Unit 3 (a): Applied mechanical measurements		
11 HOURS	Speed measurement	Classification of tachometers, Revolution counters, Eddy current tachometers	
	Displacement measurement	Linear variable Differential transformers (LVDT)	
	Flow measurement	Rotometers, Turbine meter	
	Temperature measurement	Resistance thermometers, Optical Pyrometer	
	(b) Miscellaneous measurement		
	Humidity measurement	hair hygrometer	
	Density measurement	hydrometer	
	Liquid level measurement	sight glass, Float gauge	
	Unit 4 (a): Limits, Fits & Tolerances		
12 HOURS		Concept of Limits, Fits, and Tolerances; Selective Assembly; Interchangeability; Hole And Shaft Basis System; Taylor's Principle	
	(b): Angular Measurement		
	Concept	Instruments For Angular Measurements; Working and Use	
	Instruments principle and working	Working and Use of Universal Bevel Protractor, Sine Bar, Spirit Level; Principle of Working of Clinometers; Angle Gauges	
	(c): Screw thread Measurements		
	Introduction	ISO grade and fits of thread; Errors in threads	
	Measurement of different elements	major diameter, minor diameter, effective diameter, pitch	
	Methods of measurement	Two wire method; Thread gauge micrometer; Working principle offloating carriage dial micrometer.	
	Unit 5 (a): Gear Measurement and Testing		
11 HOURS		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	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 2023
Semester	THIRD
Course Code	MEPC207
Course Name	MANUFACTURING ENGINEERING
Course Type	PROGRAMME CORE
L-T-P	3-1-0
Name of Faculty	DR. A. K. BHARDWAJ
Semester Start & End Dates	10-08-2023 TO 04-12-2023

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.	MANUFACTURING ENGINEERING	3	1	0	40	0	40	60	3	0	0	60	100
2.	MANUFACTURING ENGINEERING	0	2	4	0	40	40	0	0	60	3	60	100

HOURS	Unit & Topic of Discussion	Topic Details	Delivery Method
	UNIT-I: Cutting Fluids & Lubricants		
11 HOURS		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. 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	
	Unit-2 :Broaching Machines		
10 HOURS		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. Drilling: Classification; Basic parts and their functions; Radial drilling machine; Types of operations; Specifications of drilling machine; Types of drills and reamers.	

	Unit-3 : Welding & Milling	CHALK- BLACKBOARD & USING TECHNOLOGICAL PADA GOGY
12 HOURS	Welding: Classification; Gas welding techniques; Types of welding flames; Arc Welding -Principle, Equipment, Applications; Shielded metal arcwelding; Submerged arc welding; TIG / MIG welding; Resistance welding - Spot welding, Seam welding, Projection welding; Welding defects; Brazing and soldering. Milling: 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.	
	Unit-4 : Gear Making, Press working,	
12 HOURS	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; 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 dieshoe, guide pin, bolster plate, stripper, stock guide, feed stock, pilot; Punch and die clearances for blanking and piercing, effect of clearance.	
	Unit -5: Grinding and finishing processes:	
11 HOURS	Grinding and finishing processes: 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, 15 Plating metals, applications; Hot dipping: Galvanizing, Tin coating, Parkerising, Anodizing; Metal spraying: wire process, powder process and applications; Organic coatings;Finishing specifications.	

	Name of Book	Author Name	Publication
Prescribed Books	Manufacturing technology	P N Rao	Tata Mc Graw -Hill Publications
	Production Technology (Volume I&II)	O.P. Khanna & Lal	Dhanpat Rai Publications


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LESSON PLAN

Academic Session	AUG - DEC 2023
Semester	THIRD
Course Code	MEPC209
Course Name	THERMAL ENGINEERING-I
Course Type	PROGRAMME CORE
L-T-P	3-1-0
Name of Faculty	MUNEESH KUMAR
Semester Start & End Dates	10-08-2023 TO 04-12-2023

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
2.	THERMAL ENGINEERING-I LAB	0	0	2	0	40	40	0	0	60	3	60	100

HOURS	Unit & Topic of Discussion	Topic Details	Delivery Method
Unit-1 : Sources of Energy			
9 HOURS	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	
Unit-2 : Internal Combustion Engines			
11 HOURS	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			
12 HOURS	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 injector (description with line diagram)	CHALK- BLACKBO ARD & USING TECHNOL OGICAL PADAGO GY
	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 HOURS	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			
13 HOURS	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)			
	Refrigeration	Refrigerant; COP; Air Refrigeration system: components, working & applications	
	Vapor Compression system	components, working & applications	
	Air conditioning	Classification of Air-conditioning systems; Window AirConditioner; Summer Air-Conditioning system, Winter Air-Conditioning system, Year-round AirConditioning system, Central air conditioning system	

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

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