


**GOVT. POLYTECHNIC KANGRA**  
**PLANNED THEORY SYLLABUS COVERAGE**

<b>GP Kangra</b>		<b>Department: MECHANICAL ENGG.</b>		<b>Subject:- THERMAL ENGG.-I</b>		
<b>SYLLABUS COVERAGE</b>		<b>Sem. &amp; Branch : 3<sup>rd</sup> / Mech. Engg.</b>			<b>Duration:3 Years</b>	
		<b>Total Periods:-56</b>			<b>Practical:- 28</b>	
<b>Sr. No.</b>	<b>Period No's</b>	<b>Topic</b>	<b>Details</b>	<b>Instruction Reference</b>	<b>Additional Study Recommended</b>	<b>Remarks</b>
1	1-8	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; Tidal Energy; Ocean Thermal Energy; Geothermal Energy; Biogas, Biomass, Bio-diesel; Hydraulic Energy	A Course in Thermal Engineering- S. Domkundwar & C.P. Kothandaraman, Dhanpat Rai.		
2	9-18	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. 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.	Thermal Engineering- R.S.Khurmi and J.K.Gupta.  Introduction to Renewable Energy- Vaughn Nelson,		
3	19-30	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 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	-----do-----		

4	31-40	Performance of I.C. Engines	<p>magneto ignition (description and working). Comparison of two systems; Types of lubricating systems used in I.C. engines with line diagram; Objective of turbocharging and supercharging</p> <p>Brake power; Indicated power; Frictional power; Brake and Indicated mean effective pressures; Brake and Indicated thermal efficiencies; Mechanical efficiency; Relative efficiency; Performance test; Morse test; Heat balance sheet; Methods of determination of B.P., I.P. and F.P.; Simple nu Air</p>	-----do-----		
5	41-56	Compressors	<p><b>Compressors:</b> 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. 17</p>			
		Refrigeration & Air-conditioning (Problems omitted)	<p>Refrigeration; Refrigerant; COP; Air Refrigeration system: components, working &amp; applications; Vapour Compression system: components, working &amp; 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. merical problems on performance of I.C. engines.</p>			

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**GOVT. POLYTECHNIC KANGRA**  
**PLANNED THEORY SYLLABUS COVERAGE**

PISC-7.1

GPK		Department: Mechanical Engineering		Subject: Manufacturing Engineering		
SYLLABUS COVERAGE		Sem. & Branch : 3 <sup>rd</sup> Mechanical Engineering		Duration : 14 weeks		
		Total Periods		Theory : 56 Practical : 84		
Sr No	Period Nos	Topic	Details	Instruction Reference	Additional Study Recommended	Remarks
1.	1					
1.	2-7	Cutting Fluids & Lubricants	Introduction to Manufacturing Engineering Syllabus overview and Evaluation scheme 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.	Manufacturing technology-P.N. Rao, Tata McGraw-Hill Publications	Production Technology-R.B. Gupta, Satya Prakashan, New Delhi	
2.	8-13	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.	Elements of workshop Technology (Volume I&II)-S.K. Hajra Chaudary, Bose & Roy, Media Promoters and Publishers Limited.	Manufacturing Technology, Metal Cutting & Machine tools-P.N. Rao, Tata McGraw-Hill Publications	
3.	14-20	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.	21-24	Drilling	Classification; Basic parts and their functions; Radial drilling machine; Types of operations; Specifications of drilling machine; Types of drills and reamers.	Production Technology (Volume I&II)-O.P. Khanna & Lal, Dhanpat Rai Publications.	Fundamental of metal cutting and machine tools-B.L. Juneja, New age international limited.	
5.	25-30	Welding	Classification; Gas welding techniques; Types of weld flames; Arc Welding -Principle, Equipments Applications; Shielded metal arc welding; Submerged arc welding; TIG / MIG welding; Resistance welding Spot welding, Seam welding, Projection welder Welding defects; Brazing and soldering			



6.	31-36	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.		
7.	37-42	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.		
8.	43-50	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.		
9.	51-56	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, Plating metals, applications; Hot dipping: Galvanizing, Tin coating, Parkerising, Anodizing; Metal spraying: wire process, powder process and applications; Organic coatings; Finishing specifications.		

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### PLANNED SYLLABUS COVERAGE (THEORY)

G P Kangra		Department: Mechanical Engg. –Subject- MATERIAL SCIENCE & ENGINEERING				
		Course Diploma- Duration: 3 Years				
SYLLABUS COVERAGE		Total Periods : 56 Theory : 56				
Sr No	Period No.	Topic	Details	Instruction Reference	Additional Study Recommended	Remarks
1	1 –13	Crystal structures and Bonds	<p><b>Unit cell and space lattice:</b></p> <p>(1.1) Crystal system: The seven basic crystal systems.</p> <p>(1.2) Crystal structure for metallic elements: BCC, FCC and HCP.</p> <p>(1.3) Coordination number for Simple Cubic, BCC and FCC.</p> <p>(1.4) Atomic radius: definition, atomic radius for Simple Cubic, BCC and FCC (Formula for the above terms without Derivation).</p> <p>(1.5) Atomic Packing Factor for Simple Cubic, BCC, FCC and HCP ( derivations omitted)</p> <p><b>Bonds in solids:</b></p> <p>(1.6) Classification-primary or chemical bond, secondary or molecular bond.</p> <p>(1.7) Concept of Types of primary bonds: Ionic, Covalent and Metallic Bonds.</p>	MATERIAL SCIENCE & ENGINEERING (R.K. Rajput)		
2	14-26	Phase diagrams, Ferrous metals and its Alloys	<p>(2.1) Introduction of Isomorphs, eutectic and eutectoid systems.</p> <p>(2.2) Iron-Carbon binary diagram.</p> <p>(2.3) 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.</p> <p>(2.4) . Standard commercial grades of steel as per BIS and AISI.</p> <p>(2.5) Alloy Steels – purpose of alloying. effects of alloying elements,</p> <p>(2.6) Important alloy steels: Silicon steel, High Speed Steel (HSS), heat resisting steel, spring steel, Stainless Steel (SS).</p>	MATERIAL SCIENCE ( O.P. Khanna)		
3	27-36	Non-ferrous metals and its Alloys	<p>(3.1) Properties and uses of aluminum, copper, tin, lead, zinc, magnesium and nickel.</p> <p>(3.2) Copper alloys: Brasses, bronzes – composition, properties and uses.</p> <p>(3.3) Aluminum alloys: Duralumin, hinalium, magnelium – composition, properties and uses.</p> <p>(3.4) Nickel alloys: Inconel, monel, nicrome – composition, properties and uses.</p> <p>(3.5). Anti-friction/Bearing alloys: Various types of bearing, bronzes-Standard commercial grades as per BIS/ASME.</p>			



Sr No	Period No	Topic	Details	Instruction Reference	Additional Study Recommend	Remarks
4	37-45	Failure analysis & Testing of Materials	<p>(4.1): Introduction to failure analysis. Fracture: ductile fracture, brittle fracture, cleavage, notch sensitivity, fatigue.</p> <p>(4.2) concept of endurance limit, concept of creep, creep curve, creep fracture</p> <p>(4.3) Destructive testing: Tensile testing, compression testing, Hardness testing: Brinell, Rockwell, bend test, torsion test, fatigue test, creep test.</p> <p>(4.4) Non-destructive testing: Visual Inspection, magnetic particle inspection, liquid penetrant test, ultrasonic inspection, radiography.</p> <p>(5.1): Nature of corrosion and its causes.</p> <p>(5.2): Electrolytes.</p> <p>(5.3): Factors affecting corrosion: Environment, Material properties and physical conditions.</p> <p>(5.4) Types of corrosion.</p> <p>(5.5) Corrosion control: Material selection, environment control.</p>	MATERIAL SCIENCE & ENGINEERING (R.K. Rajput)		
5	46-54	Corrosion & Surface Engineering	<p>(5.6) Surface engineering processes: Coatings and surface treatments, Cleaning and mechanical finishing of surfaces.</p> <p>(5.7) Electroplating and Special metallic plating.</p> <p>(5.8) Electro polishing and photo-etching. - Conversion coatings: Oxide, phosphate and chromate coatings. Thin film coatings: PVD and CVD.</p> <p>(5.9) Hard-facing, thermal spraying and high-energy processes.</p>	MATERIAL SCIENCE (O.P. Khanna)		

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# PLANNED SYLLABUS COVERAGE(Theory)

G P  
Kangra

Department: Mechanical Engineering Subject : Basic Mechanical Engineering

Course - Diploma

Duration - 14 weeks

Total Periods - 56

Theory - 56 hours

SYLLABUS

Sr.No

Period Nos

Topic

Details

Instruction  
references

Additional Study  
Recommended

Remarks

1

1 TO 14

Introduction to  
Thermodynamics -

(1-5)

Role of Thermodynamics in Engineering and science  
Types of Systems, Thermodynamic Equilibrium,  
Properties: State, Process and Cycle.

(6-10)

Elementary introduction to Zeroth, First  
and Second laws of thermodynamics, Heat and Work  
Interactions for various processes

(11-14)

Concept of Heat Engine, Heat Pump & Refrigerator.  
Efficiency/COP, Kelvin-Planck and Clausius Statements,  
Carnot Cycle, Carnot Efficiency, T-S and P-V Diagrams,  
Concept of Entropy

Basic  
Mechanical  
Engineering  
-  
M.P.Poonia  
& S.C.  
Sharma,  
Khanna  
Publishing  
House, Delhi

Elements of  
Mechanical  
Engineering - M.L.  
Mathur, F.S.Mehra  
and R.P. Tiwari, Jain  
Brothers, New Delhi

2

15 TO 25

Heat transfer & Thermal  
Power Plant:

(15-20)

Heat Transfer, Modes of Heat Transfer, Conduction  
Fourier Equation, Conduction heat transfer through  
Composite Walls, Simple Numerical Problems, Convection  
Heat transfer - Natural and forced convection, Radiation  
Absorption, Reflection and transmission of radiation

(21-25)

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

3

26 TO 34

Steam Turbines &  
Internal Combustion  
Engines

(26-30)

Impulse and Reaction Turbines, Condensers, Jet &  
Surface Condensers, Cooling Towers

(31-32)

Otto, Diesel and Dual cycles, P-V and T-S Diagrams

(33-34)

IC Engines 2-Stroke and 4-Stroke I.C. Engines, SI and  
CI Engines

4

35 TO 45

Materials and  
Manufacturing Processes  
(derivations and  
Problems omitted):

(35-38)

Engineering Materials, Classification and their Properties  
Metal Casting, Moulding, Patterns

(39-42)

Metal Working: Hot Working and Cold Working, Metal  
Forming: Extrusion, Forging, Rolling, Drawing

(43-45)

Gas Welding, Arc Welding, Soldering, and Brazing

5

46 TO 56

Machine Tools and  
Machining Processes

(46-49)

Machine Tools: Lathe Machine and types, Lathe  
Operations

(50-53)

Milling Machine and types, Milling Operations, Shaper  
and Planer Machines

(54-56)

Differences, Quick Return Motion Mechanism, Drilling  
Machine Operations, Grinding Machine Operations

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<b>GP Kangra</b>	Department: <b>Mechanical Engineering</b> Subject: <b>Measurements &amp; Metrology</b>	
	Course: <b>Diploma</b>	Duration: <b>03 Years</b>
<b>Syllabus Planned</b>	Total Periods: <b>56(T)</b>	Theory: <b>56</b>

### **SYLLABUS PLANNED**

S. N.	Period No.	Topic	Details	Instruction Reference	Additional Study recommended	Remarks
1.	1-7	Introduction to measurements	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).	Instrumentation measurement and analysis- B.C.Nakara, K.K.Chaudhary,second edition, Tata mc graw Hill, 2005.		
2.	08-14	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; Coordinating measuring machine.			
3.	15-20	Transducers and Strain gauges	Introduction; Transducers: Characteristics, classification of transducers, Strain Measurements(concept only) Strain gauge, Classification, mounting of strain gauges, (Theoretical aspects)	Engineering Metrology- R.K.Jain, Khanna Publishers, NewDelhi,2005.		
4.	21-25	Measurement of force, torque, and pressure(derivations omitted)	Introduction; Force measurement: Spring Balance , Load cell; Torque measurement: Prony brake, Eddy current, Hydraulic dynamometer; Pressure measurement: Mcloed gauge.			
5.	26-31	Applied mechanical measurements	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.			



6.	32-36	Miscellaneous measurements (Problems omitted)	Humidity measurement: hair hygrometer; Density measurement: hydrometer; Liquid level measurement, sight glass, Float gauge.			
7.	37-40	Limits, Fits & Tolerances	Concept of Limits, Fits, and Tolerances; Selective Assembly; Interchangeability; Hole And Shaft Basis System; Taylor's Principle.			
8.	41-44	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.			
9.	45-49	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; Two wire method; Thread gauge micrometer; Working principle of floating carriage dial micrometer.			
10.	50-53	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.			
11.	54-56	Machine tool testing	Parallelism; Straightness; Squareness; Coaxiality; roundness; run out; alignment testing of machine tools as per IS standard procedure.			

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Date:- 10/05/23	