DEPARTMENT OF MECHANICAL ENGINEERING
GOVERNMENT CO-ED POLYTECHNIC, JAGDALPUR
Near RTO office Aadawal, Jagdalpur, Bastar (C.G) - 494001
Email: mechanical.gcpb@gmail.com

DEPARTMENT OF MECHANICAL ENGINEERING

LESSON PLAN

SESSION: APR - MAY 2025

Name of Faculty: Rakesh Kumar Ray	
Subject: Theory of Machine	
Subject Code: 2037471(037)	
Semester: Diploma 4th Sem	
Text Books	**Theory of Machines: Rattan S. S.**
	Theory of Machines: Khurmi R. S. Gupta J. K.
Ref. Books	**Theory of Machines: Bevan Thomas**
	Theory of Machines: Bansal R.K., Brar J. S.

TOTAL CLASS SCHEDULED:	**80**
TOTAL CLASS TAKEN:	**68**

Faculty Signature (Rakesh Kumar Ray)	**HOD Signature**

Principal
Govt. Co-Ed Polytechnic
Jagdalpur, Adawal

LECT. N0.	UNIT N0.	TOPIC TO BE COVERED	DATE OF LECTURE	REMARKS
		UNIT-1 Popular Planar Mechanisms	27.01.2025 - 20.01.2025	
1	1	Kinematics of Machines: Introduction to Statics, Kinematics, Kinetics, Dynamics.		
2		Mechanism and machine, rigid and resistant bodies,		
3		Kinematic links, joints, pairs, chain and its types,		
4		Degree of freedom,		
5		Constrained motion and its types.		
6		Four link planar mechanisms and Inversions		
7		Four bar chain: Locomotive coupler, Beam engine and Pantograph.		
8		Single slider Crank chain: Pendulum pump, Rotary I.C. engine mechanism,		
9		Oscillating cylinder engine, Whitworth quick return Mechanism, Quick return mechanism of shaper.		
10		Double Slider chain: Scotch Yoke mechanism, Elliptical trammels, Oldham's Coupling.		

LECT. N0.	UNIT N0.	TOPIC TO BE COVERED	DATE OF LECTURE	REMARKS
		UNIT-2 Velocity and Acceleration in Mechanisms	21.01.2025 - 10.02.2025	
11	2	Concept of relative velocity and relative acceleration of a point on a link,		
12		Angular acceleration, and angular velocity		
13		Interrelation between linear and angular velocity and acceleration.		
14		Analytical method and Klein's construction to determine velocity and		
15		Analytical method and Klein's construction to determine acceleration		
16		Velocity and acceleration diagrams for simple mechanisms.		
17		Determination of velocity and acceleration of point		
18		relative velocity method (Excluding Coriolis component of acceleration)		
19		Mechanical advantage calculation.		

LECT. N0.	UNIT N0.	TOPIC TO BE COVERED	DATE OF LECTURE	REMARKS
		UNIT-3 Application of Friction		
20		Clutches: Classification, Functions and Applications, Construction and principle of working		
21		Single-plate clutch, multi-plate clutch,		
22		Centrifugal Clutch Cone clutch Diaphragm clutch.		
23		Calculation of power loss assuming uniform pressure Theory.		
24		Calculation of power loss assuming uniform wear theory.		
25		Brakes: Functions, Types, Applications		
26		Construction and working principle of Shoe brake, Band brake		
27	3	Construction and working principle of Internal expanding shoe brake	11.02.2025 - 30.02.2025	
28		Construction and working principle of Disc Brake		
29		Braking force, braking torque and power for shoe and band brakes.		
30		Dynamometer: Meaning need and type.		
31		Bearings: Classification of bearings – rolling contact and sliding contact bearings,		
32		types of rolling contact bearings and types of sliding contact bearings		
33		Advantages and disadvantages of rolling and sliding contact bearing and their application,		
34		Designation of bearings.		

LECT. N0.	UNIT N0.	TOPIC TO BE COVERED	DATE OF LECTURE	REMARKS
		UNIT-4 Cams and Followers		
35		Introduction to Cams and Followers. Cam and follower terminology.		
36		Classification of Cams and Followers. Applications of Cams and Followers.		
37		Types of follower motions-uniform velocity		
38		Types of follower motions- uniform acceleration and		
39		Types of follower motions- S.H.M		
40	4	Concept of radial and transverse velocity	01.03.2025 - 20.03.2025	
41		Types of follower motions-Cycloidal motion		
42		Displacement, velocity and acceleration diagrams.		
43		Drawing of profile of a radial cam based on given motion of reciprocating knife-edge follower		
44		Drawing of profile of a radial cam based on given motion of roller follower		
45		Drawing of profile of a radial cam based on given motion with offset.		

46		Drawing of profile of a radial cam based on given motion without offset		

LECT. N0.	UNIT N0.	TOPIC TO BE COVERED	DATE OF LECTURE	REMARKS
		UNIT-5 Power Transmission		
47		Belt Drives – Introduction to Flat belt, V-belt & its applications,		
48		Materials used for flat and V-belts. Introduction of timing belt and pulley.		
49		Angle of lap, length of belt, Slip and creep. Determination of velocity ratio of tight side and slack side tension,		
50		Centrifugal tension and initial tension, condition for maximum power transmission. Merits, demerits and selection of belts for given applications.		
51	5	Chain Drives – Introduction to chain Drive, types of chain and sprockets, Methods of lubrication.	21.03.2025 - 10.04.2025	
52		Merits, demerits and selection of chains for given applications.		
53		Gear Drives – Introduction to gear drives, Classification of gears,		
54		Law of gearing, gear terminology,		
55		Gear trains- Types of gear Train,		
56		Gear trains- simple and compound gear train		
57		Gear trains- reverted and epicyclic gear train.		
58		Computation of velocity ratio in gear train.		

LECT. N0.	UNIT N0.	TOPIC TO BE COVERED	DATE OF LECTURE	REMARKS
		UNIT-6 Flywheel and Governors		
59		Dynamics of reciprocating engine mechanism,		
60		Inertia force due to reciprocating mass.		
61		Piston effort, crank effort, turning moment of crank shaft.		
62		Fluctuation of energy and speed		
63		Coefficient of fluctuation of energy and speed.		
64		Principle and application of flywheel.		
65	6	Governor- Function of governor and its comparison with flywheel.	11.04.2025 - 20.04.2025	
66		Classification of governor, Watt and Porter Governor.		
67		Classification of governor Proell, Hartnell governor		
68		Classification of governor and their construction and working.		
69		Equation for lift of governors.		
70		Terms related to governor like Sensitivity, stability,		
71		governor like Isochronous, Governor effort and power.		

LECT. N0.	UNIT N0.	TOPIC TO BE COVERED	DATE OF LECTURE	REMARKS
		UNIT-7 Balancing of Rotating and Reciprocating unbalanced masses and vibrations	21.04.2025 - 15.05.2025	
72	7	Balancing- Need and types of balancing, Effects of unbalanced masses.		
73		Balancing of rotating masses in same plane- Analytical method		
74		Balancing of rotating masses in same plane- Graphical methods		
75		Balancing of several masses revolving in same plane.		
76		Balancing of reciprocating masses. (No numerical examples).		
77		Balancing of masses. (No numerical examples).		
78		Elements of vibrations,		
79		Natural frequency of single degree of freedom systems.		
80		Natural frequency with different method (No numerical examples).		
81		Natural frequency with different method (No numerical examples).		

GOVERNMENT CO-ED POLYTECHNIC, JAGDALPUR
BASTAR(C.G)
DEPARTMENT OF MECHANICAL ENGINEERING

LESSON PLAN

Session: - **Apr-May 2025**

Semester: - **4th**

Session start date as per University Calendar: - **29.01.2025**

Course Name: - **Manufacturing Process**

Course Code: - **2037472 (037)**

Name of Subject teacher: - **BHUPESH SAHU**

CO-1 Select suitable manufacturing process to produce various components.				
Class Room Instruction (CI)	**No. of Periods**	**Laboratory Instruction (LI)**	**No. of Periods**	**Remark**
1.1 Classification of basic manufacturing process based on chip-less and chip-removal processes, Primary and Secondary manufacturing processes, Various generating & forming processes		LE1.1 Identify five domestic/industrial components, select the type of manufacturing process required to produce them with justification		
1.2 Factors which influence selection of manufacturing process for a particular application.				
1.3 Recall mechanical properties of metals.				
Number of periods planned (CI + LI): 14 **Number of periods actually taken**:				
CO-2 Prepare product using different casting processes.				
Class Room Instruction (CI)	**No. of Periods**	**Laboratory Instruction (LI)**	**No. of Periods**	**Remark**
2.1 Definition and Need		LE2.1 Prepare a pattern drawing, pattern and core for the given component or component drawing.		
2.2 Pattern: types, materials, pattern allowances, color code, applications		LE2.2 Prepare a sand mould using the given single piece pattern.		
2.3 Cores: Need, types, materials		LE2.3 Prepare a sand mould using the given split pattern.		
2.4 Moulds: Molding sand: Types, properties, binders, additives, mixing, Molding equipments & tools		LE2.4 Prepare casting using the mould made in 2.2 and wax in place of molten metal.		

Type of moulds, mould making, applications				
2.5 Melting of metal: Pit furnace, Cupola, Induction furnace				
2.6 Metal pouring: Gates and Risers.				
2.7 Casting Processes: Dry sand mould casting, Shell mould casting, Investment casting, Die casting, Centrifugal casting.				
2.8 Casting defects: Blow, scar, blister, gas holes, pin holes, porosity, drop, inclusion, dross, dirt, wash, buckle, scab, rat tail, penetration, swell, misrun, cold shut, hot tear, shrinkage cavity, mould shift, core shift				
2.9 Inspection of castings: Visual inspection, pressure test, magnetic particle inspection, dye penetration inspection, Radiographic inspection, ultrasonic inspection. 2.10 Safety precautions in metal casting.				
Number of periods planned (CI + LI): 18 **Number of periods actually taken**:				
CO-3 Prepare product using different forming processes.				
Class Room Instruction (CI)	**No. of Periods**	**Laboratory Instruction (LI)**	**No. of Periods**	**Remark**
3.1 Cold and Hot working of metals, effect on metal properties, advantages & limitations.		LE3.1 Prepare aluminum washer using flywheel press.		
3.2 Forming processes, types, working principle, tools and equipment, applications of: Rolling, Forging, Drawing, Deep drawing, Extrusion. 3.3 Safety precautions.		LE3.2 Prepare two jobs using hot forging.		
3.4 Press working: Emphasis that press working is not forming process, Punching, Blanking, Notching, Lancing, Slitting, Nibbling, Trimming.				
Number of periods planned (CI + LI): 16 **Number of periods actually taken**:				
CO-4 Use joining process to produce jobs.				

Class Room Instruction (CI)	No. of Periods	Laboratory Instruction (LI)	No. of Periods	Remark
4.1 Classification, recall gas and arc welding processes.		LE4.1 Prepare a lap joint using spot welding equipment.		
4.2 Working principle, equipment, sketch, process parameters, applications of: i. MIG, TIG, Flux coated arc and submerged arc ii. Resistance welding – Butt, Seam, Spot, Projection and Percussion. iii. Thermit welding. iv. Forged welding		LE4.2 Use seam welding to join two sheets of metal.		
4.3 Effects of welding heat		LE4.3 Prepare a V – Butt joint using TIG welding.		
4.4 Weld defects and their causes. 4.5 Safety precautions in welding.		LE4.4 Use MIG welding to join the given metal pipe.		
		LE4.5 Prepare a Balcony grill using welding of Stainless-Steel pipes.		
Number of periods planned (CI + LI): 16 **Number of periods actually taken**:				
CO-5 Produce jobs using plastic molding process.				
Class Room Instruction (CI)	**No. of Periods**	**Laboratory Instruction (LI)**	**No. of Periods**	**Remark**
5.1 Plastic Molding: Concept, working principle, equipment and applications of Compression molding, Blow molding, Injection molding and Extrusion. 5.2 Safety precautions.		LE5.1 Prepare a given job using blow molding process.		
5.3 Powder Metallurgy: Introduction, advantages and disadvantages, Powder metallurgy processes: Powder making, blending, compacting, sintering, infiltration and impregnation, Applications 5.4 Safety Precautions.		LE5.2 Prepare a job using injection molding process.		
Number of periods planned (CI + LI): 16 **Number of periods actually taken**:				
Number of Total periods planned: **Number of Total periods actually taken:** **Subject Teacher: BHUPESH SAHU**				

(Name and Signature)

HOD
(Department of Mechanical Engineering)

Principal
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GOVERNMENT CO-ED POLYTECHNIC, JAGDALPUR BASTAR (C.G)
DEPARTMENT OF MECHANICAL ENGINEERING

LESSON PLAN

Session: - **APRIL-MAY 2025**

Semester: - **4th**

Session starts date as per University Calendar: - **27-01-2025**

Course Name: - **INDUSTRIAL MEASUREMENT & CONTROL**

Course Code: - **2037473(037)**

Name of Subject teacher: - **PRAVEEN KUMAR HIRWANI**

CO-1 Use relevant measuring instrument as per the requirement.				
Class Room Instruction (CI)	**No. of Periods**	**Laboratory Instruction (LI)**	**No. of Periods**	**Remark**
1.Measurement system: 1.1 Introduction to measurement and measuring instruments, Classification of measuring Instruments, their characteristics like sensitivity, accuracy, linearity, threshold, resolution, etc.	03	LE1.1 Identify the contact and non-contact transducers from the given samples of transducers.	01	
1.2 Measuring system, Block diagram with example, stages of measuring system with examples – Stage I input signal (detector transducers), Stage II (intermediate modifying), and Stage III (terminating), Types of input signals.	03	LE1.2 Measure the distance using ultrasonic transducers.	01	
1.3 Measurement standards: - Time, frequency, Voltage, Current, 3-15 psi etc. ANSI, ASME, ADA, BS, DIN, CSMR,	01	LE1.3 Measure the vibration parameters using Piezo-electric Transducer.	01	

FCI, API, ISI, and introduction Reliability and safety.				
1.4 Transducers –primary and secondary transducers, classification, working principle of resistance, inductance, capacitance and piezoelectric transducers with their line sketches, applications of each, sensors, types and applications, difference between transducer and sensor.	03			
Number of periods planned (CI + LI): 13 **Number of periods actually taken**:				
CO-2 Use control system for the given industrial application.				
Class Room Instruction (CI)	**No. of Periods**	**Laboratory Instruction (LI)**	**No. of Periods**	**Remark**
2.Introduction to Control system: 2.1 Definition, Basic terminology, Objective of control system, Types of Control Systems, Effect of Feedback Systems.	02	LE2.1 Identify different elements of the given open loop and closed loop control systems	01	
2.2 Basic elements of open and closed loop system, concept of open loop and closed loop systems, Block diagram of Open loop and closed loop control systems, Effect of feedback, multivariable control systems comparison, Applications and advantage.	03	LE2.2 Control the temperature of an oven by using ON/OFF controller.	01	
2.3 Time Response of feedback control systems: Standard test signals -unit step, ramp, impulse and parabolic.	02			

2.4 Process Control and its benefits, Basic control actions, two position or On/Off control, Introduction to PI, PD and PID Controllers.	03			
2.5 Control System Components: construction and working, concept of ac servomotor, synchronous and stepper motor.	03			
Number of periods planned (CI + LI): 15 **Number of periods actually taken**:				
CO-3 Use relevant instruments for displacement and speed measurement.				
Class Room Instruction (CI)	**No. of Periods**	**Laboratory Instruction (LI)**	**No. of Periods**	**Remark**
3. Displacement and speed measurement: 3.1 Working principle & use of Potentiometer, Differential transformer (LVDT & RVDT), capacitive element & Optical encoders.	04	LE3.1 Measure the displacement of core using LVDT.	01	
3.2 Mechanical tachometer, Electrical Tachometer, incremental optical encoder, Eddy current drag cup tachometer.	02	LE3.2 Measure the displacement using Capacitive Transducer:	01	
3.3 Magnetic pickup tachometer, Stroboscopic tachometer, Photoelectric tachometer, Non contacting electrical tachometer (inductive pick up & capacitive pick up).	03	LE3.3 Measure the speed of a motor shaft using Stroboscope.	01	
		LE3.4 Measure the speed of an electric motor with given type of tachometer.	01	
Number of periods planned (CI + LI): 13 **Number of periods actually taken**:				
CO-4 Use temperature measuring instruments.				

Class Room Instruction (CI)	No. of Periods	Laboratory Instruction (LI)	No. of Periods	Remark
4. Temperature measurement: 4.1 Principles of temperature measuring devices – change in physical state, expansion, electrical resistance, thermoelectric emf, intensity of radiation, change in chemical state.	02	LE4.1 Measure the temperature with different devices e.g. glass thermometer, bimetallic thermometer, RTD, thermocouple and compare the results.	01	
4.2 Construction, working, measuring range, accuracy, applications, limitations of devices operating on above principles (Bimetal thermometer, pressure spring thermometer, electrical resistance thermometer, thermistor, thermocouple, pyrometer).	03	LE4.2 Calibrate the Thermocouple for temperature measurement.	01	
4.3 Errors in temperature measurement i. Instrument error – calibration error, ambient temperature error, hysteresis error. ii. Thermal probe error – time lay error, conduction error, radiation error, velocity of error.	03	LE4.3 Verify the resistance Temperature characteristics of given thermistor.	01	
4.4 Calibration of temperature measuring instruments - Direct comparison method, fixed point method.	02			
Number of periods planned (CI + LI): 13 **Number of periods actually taken**:				
CO-5 Use flow measurements and pressure measurements instruments.				
Class Room Instruction (CI)	**No. of Periods**	**Laboratory Instruction (LI)**	**No. of Periods**	**Remark**

5. Flow and Pressure measurement: (**A) Flow measurement** 5.1 Classify flow measuring devices as Volumetric or primary or quantity meters and rate of flow or velocity or secondary meters, their function and examples.	01	LE5.1 Measure the flow of running liquid using Rotameter.	01	
5.2 Volumetric or Primary meters - Bellow type meter, Rotating impeller type meter, Positive displacement meter, Rotating lobe meter, Nutating disc meter Their function, working principle, sketches, applications and limitations.	02			
5.3 Rate of flow or Secondary meters – Obstruction meters □ Orifice □ Venturi meter □ Flow nozzles, □ Variable area meter □ Pitot tube Velocity probes □ Total pressure probes, □ Static pressure probes Special meters □ Turbine meter □ Hot wire anemometer, Magnetic flow meter Their function, working principle, sketches, applications and limitations.	02			
(B) Pressure Measurement 5.4 Classify pressure measuring devices – Manometer, Elastic gauges	02	LE5.2 Measure Pressure using bellows.	01	

□ Diaphragm □ Pressure capsules, □ Bellows □ Pressure springs Electronic pressure sensors/Transducers - Resistance, Inductance and Capacitive type				
5.5 There function, principle, working, sketches, applications and limitations of above pressure measuring devices.	01	LE5.3 Measure Pressure using diaphragms.	01	
5.6 Low pressure gauges- McLeod Gauge, Pirani gauge.	01	LE5.4 Measure Pressure Using Bourdon Pressure Gauge.	01	
5.7 Calibration of pressure gauges using Dead weight Pressure tester.	01	LE5.5 Calibrate a given Pressure Gauge Using Dead Weight Pressure Gauge Tester.	01	
Number of periods planned (CI + LI): 14 **Number of periods actually taken**:				
CO-6 Use relevant instruments for measurement of strain.				
Class Room Instruction (CI)	**No. of Periods**	**Laboratory Instruction (LI)**	**No. of Periods**	**Remark**
6. Strain measurements: 6.1 Strain Measurement Stress- strain relation, types of strain gauges, strain gauge materials.	3	LE6.1 Measurement of strain on a beam using strain gauge	01	
6.2 Resistance strain gauge- bonded and unbonded, types (foil, semiconductor, wire wound gauges),	4	LE6.2 Determine the modulus of elasticity of a cantilever beam using strain gauges (Both static and dynamic loading can be used).	01	
6.3 Selection and installation of strain gauges, load cells, Strain rosettes.	3			
Number of periods planned (CI + LI): 12 **Number of periods actually taken**:				
Number of Total periods planned: 80 **Number of Total periods actually taken:72**				

Subject Teacher : PRAVEEN KUMAR HIRWANI

(Name and Signature)

HOD

(Department of Mechanical Engineering)

Principal

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DEPARTMENT OF MECHANICAL ENGINEERING

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LESSION PLAN

Name of the faculty :- Mr. AMAR XALXO
Semester :- 4th
Subject Name- Fluid Mechanics and Machinery 2037474(037)
Lession Plan Duration (L+P+T) :- 80Hrs (From Jan. To June. 2025)

S.No.	No. Of Periods	Topic Name	Practicals
	(Approx.Hrs: L+P+T =24)	**Unit-1 Fluid properties and Fluid Pressure**	
1	1	Introduction and classification of fluid.	LE1.1 Use viscometer to determine the viscosity of a given liquid. LE1.2 Measure the rise of liquid level using capillary action in capillary tube. LE1.3 Determine the specific gravity of any given fluid. LE1.4 Use manometer/ incline manometer to measure the pressure of the given fluid. LE1.5 Determine the meta-centric height of ship model
2	3	Fluid properties-Density, Specific gravity, specific weight, specific volume, Dynamic & Kinematic viscosity	
3	4	Surface tension, Capillarity, Vapour pressure, Compressibility, Bulk modulus.Types of fluids: Ideal, Real, Newtonian, Non—Newtonian fluid	
4	4	Continuity equation and simple numerical problems based on it. Pressure, Fluid pressure, pressure head, Pressure Intensity, Concept of absolute Vacuum, Gauge Pressure, Atmospheric Pressure, Absolute Pressure	
5	4	Pressure measurement- Manometer, U- tube manometer, Incline manometer, Inverted U manometer, Piezometer.	
6	4	Concept of Total pressure, Centre of pressure, Pascal's law, Hydrostatic forces on plane and curved surface immersed in liquid and simple problems on it, Metacentre	
	(Approx. Hrs: L+P+T =08)	**Unit-2 Fluid flow energy equation**	
1	2	Various forms of energies applicable to fluid flow –Potential energy, Kinetic energy, Pressure energy,Total energy	LE-2.1 Experimentally justify Bernoulli's theorem for a viscous and incompressible fluid. LE-2.2 Determine the pressure energy, kinetic energy and datum energy of a given flowing fluid. applications like
2	2	Concept of datum pressure, Velocity and total head of fluid in motion.	
3	2	Energy equation- Steady flow energy equation and derivation of Bernoulli Theorem and its assumption and practical application. Simple numerical problems on Bernoulli equation.	
	(Approx. Hrs: L+P+T=17)	**Unit-3.0 Flow through pipes**	
1	2	Fluid flow- Steady,unsteady, uniform, non uniform, laminar and turbulent flow	LE3.1 Determine discharge through a given pipe using orifice meter, pitot tube and
2	2	Flow measurementdefinition and types of orifices, Vena	

		contraction, coefficient of contraction,Experimental determination of C_c, C_d ,C_v	venturimeter. LE3.2 Determine Cc, Cd,Cv for different types of orifices. LE3.3 Determine loss of head due to a. Sudden enlargement b. Sudden contraction c. Friction in pipes LE3.4 Determine the different types of flow Patterns by Reynolds's experiment. LE3.5 Measure the flow characteristic of given flowing fluids
3	2	Construction, working, application and simple problem on – Venturimeter, orifice meter, pitot tube, Nozzle.	
4	3	Viscous flow-Concept of viscosity of fluids, Reynolds number and its criteria for plate and pipes, Darcy –Weisbatch equation, loss of head due to friction in pipe ,Hagen-Poiseuille formula	
5	5	Flow through pipes- Pipes in series, Pipes in parallel, Head losses various types of minor and major energy loss occur in fluid flow through pipes. H.G.L. and T.E.L., surge tank, water hammer and its effects.	
	(Approx. Hrs: L+P+T=17)	**Unit-4.0 Hydraulic Turbine**	
1	2	Classification of hydraulic turbines Functions and working principle of Impulse and reaction turbine	LE4.1 Investigate the reaction force produced by the impact of a jet of water on to various target vanes LE4.2 Plot the characteristic curves of a. Pelton wheel b. Francis Turbine c. Kaplan turbine
2	2	Comparison of impulse and reaction turbine Construction and working principle of Pelton wheel, Francis and Kaplan turbine	
3	2	Selection of turbine on the basis of head and discharge, Draft tube – types, constructions, and benefit of draft tubes	
4	3	Calculation of work done, power,efficiency of turbines Safety precaution on turbines	
5	4	Impact of jet on flat and curved plate in stationary and moving blades.	
	(Approx. Hrs: L+P+T=14)	**Unit 5.0 Pumps**	
1	5	Centrifugal pumps- Construction, working principle and application of centrifugal pump. Total head of pump, Classification of centrifugal pump, impellers, casing, stages, priming and cavitations.	LE5.1 Determine the power required to drive the given Reciprocating pump. LE5.2 Determine the performance characteristics of: a. Centrifugal pump b. Reciprocating Pump
2	5	Reciprocating pumps- Construction, working principle and application of reciprocating pump,single acting and double acting, slip, negative slip,use of air vessels,Comparison of centrifugal and reciprocating pump.	
3	2	Submersible pump-Construction, working principle and application of submersible pump.	

GOVERNMENT CO-ED POLYTECHNIC JAGDALPUR

Department of MECHANICAL ENGINEERING

LESSON PLAN

Course- Engineering Metrology	
Course Instructor – SHAILESH SIDAR	**Semester - 4**

TOPIC	NO. OF PERIODS (HOURS)
UNIT -1 Introduction	**08**
Inspection, its objective and purpose, types of inspection – raw material inspection, in process inspection, final inspection, Methods of Inspection – centralized and decentralized inspection, their advantages, dis advantages and applications, Inspection report.	02
Metrology: Correlation of inspection and metrology, definition of metrology and its importance in industrial inspection, meaning of specification, Inter changeability and selective assembly,	02
Accuracy and Precision, their need in industrial measurement, relationship between cost and accuracy, Errors systematic and random,	02
Elements of measuring systems – standard, work piece, instruments person and environment, Standard, its importance material standard and wavelength standard, classification of standards – primary ,secondary, tertiary and working standards	02
UNIT-2 Linear Measurement	**14**
Standards of length –Line and End standards, their characteristics and applications, Datum planes in dimension measurement – Surface plate, V-block.	04
Classification of linear measurement instruments – direct and indirect with examples, Direct measuring instruments: i Vernier caliper, ii Micrometer –outside, inside and depth iii Vernier height gauge iv Depth gauge construction working, handling, specifications, applications, precautions and errors	04
Indirect measuring instruments: Telescopic gauges, small hole gauges –their construction, working specifications, applications, precautions and errors	02
Dial Gauge: classification as per IS: 2092-1962, schematic diagram, function of parts, working principle, accuracy, applications and precautions. 2.5 Slip gauge – Classification as per IS: 2984-1966, their accuracy, applications, selection of gauge blocks, wringing, handling and precautions.	02

UNIT-3 Angular measurements	**15**
Need for angle measurement, Direct angle measurement: i Optical Bevel Protractor ii Universal Bevel protractor. their construction, working, handling, specifications, applications ,precautions.	08
Indirect angle measurement: i Angle gauges – sets, handling, method of combining, selection of angle gauge blocks for a given angle. ii Sine bar – working principle, types as per IS:5979-1970, specifications ,handling, measuring known and unknown angles. iii Spirit level – working principle, sensitivity and factors affecting it, handling, applications, iv Autocollimator – working principle, construction, handling, applications. v Angle Dekkor – working principle ,construction, handling, applications.	07
UNIT-4 Measurement of Geometric Tolerances and Surface Roughness	**14**
Concept of straightness, flatness, squareness and roundness, importance of their measurement	01
Measurement of Straightness: Straight edge method (Light gap and feeler gauge method), Wedge method, Precision level method and Autocollimator method Their principle, instruments required for each method, precautions, limitations, applicability i.e., type of job/situation where each of methods is suitable and accuracy of each method.	02
Measurement of flatness: High spot method, Precision level method, Autocollimator method Their principle, instruments required for each method, precautions, limitations, applicability i.e., type of job/situation where each of methods is suitable and accuracy of each method.	03
Measurement of Squareness: Indicator method, Engineer's square tester, Autocollimator method Their principle, instruments required for each, method, precautions, limitations, applicability *i.e.*, type of job/situation where each of methods is suitableand accuracy of each method	02
Measurement of Roundness: V block and Dial indicator method, principle, instruments required, precautions, and limitations	02
Assessment of surface roughness: i Terminology associated with assessment of surface roughness (as per IS: 3073 – 1967) – Surface roughness, primary texture (roughness), secondary texture (waviness), real surface, geometrical surface, effective surface, real profile, geometrical profile, effective profile, reference line, lay, traversing length, sampling length, spacing of irregularities, mean line of profile, centre line of profile. ii 'M' and 'E' system of assessment of surface roughness, their merits and demerits, reasons for adoption of 'M' system, iii Basic units of indicating surface roughness – C.L.A. value, R.M.S. value, ten point height of irregularity, their graphical and mathematical interpretation iv Measurement of surface roughness (a) Comparison method – touch inspection, visual inspection, scratch inspection, microscopic inspection, their applications , limitations (b) Direct measurement – Stylus based instrument: Tomlinson surface meter, Taylor-Hobson Talysurf, Profilometer	03
Relationship of Machining processes and surface texture and their representation	01
UNIT-5 Screw Thread Measurements and Gear Measurements	**15**
Thread nomenclature, Various types of threads, Errors in screw threads: Error in Pitch	02
(Progressive and periodic), effective diameter, major diameter, minor diameter and angle	05

Methods of measuring external screw thread elements: i Pitch – Thread pitch gauge, microscope method, Pitch measuring machine ii Effective diameter – Thread micrometer, two and three wire method iii Minor diameter – Micrometer with two V – shaped hard steel pieces iv Major diameter – Micrometer v Angle or Form – Tool room projection Procedure of each method, precautions to be taken, advantages and limitations.	
Methods of internal thread measurement: i Core diameter – Using Wedge parallel and micrometer ii Effective diameter - Using optical comparator iii Thread Form – Using thread cast method, materials used for casting – plaster of Paris, Sulphur, Dental wax Procedure of each method, precautions to be taken, advantages and limitations. Gear Measurement: Terminology associated with gear measurements, recall types of gears with their sketches, Spur gear nomenclature, need of gear measurement, Gear elements requiring measurement – gear tooth form, gear tooth thickness, pitch, eccentricity.	03
Measurement of gear elements: i Gear tooth form – Principle of measurement, Use of Tool room microscope, Use of David Brown gear tooth form testing machine. ii Gear tooth thickness – Principle of measurement – Chordal thickness and Constant Chord, Use of Gear tooth vernier caliper. iii Pitch – Principle of pitch measurement, Use of Parkson gear tester. iv Eccentricity – Purpose and principle of measurement.	05
UNIT-6 Comparators and Limit Gauges	**14**
Comparators: Definition, working principle, basic requirements of a good comparator, applications.	02
Types of Comparators – Mechanical, Electrical, Optical and Pneumatic Their working, application, advantages and limitations, selection for given specific work/component.	03
Limit Gauges: Recall the terminology associated with limits, fits and tolerances, Define gauging, its need and difference with measuring, classification of gauges – according to use, according to form, according to construction, according to specific use.	03
Fixed size gauges – Plug, ring, snap and thread gauges, their sketches, applications, Go and Not Go ends of a limit gauge, their purpose and identification.	03
Taylor's principle, maximum and minimum metal conditions and their correlation with Go and Not Go gauge, working tolerance, gauge tolerance, wear allowance, calculation of gauge dimensions for a given set of data.	03

No. of Periods (Hours): 80