DIPLOMA WING

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA , BHOPAL

SCHEME OF STUDIES & EXAMINATIONS (IMPLEMENTED FROM SESSION : JULY 2023)

SCHEME	NAME OF BRANCH	BRANCH CODE	SEMESTER
OCBC JULY 2022/2023	PRODUCTION ENGINEERING	P05	FOURTH (IV)

S.N.	PAPER CODE	SUBJECT CODE	SUBJECT NAME	THEORY COMPONENT								PRACTICAL COMPONENT					TOTAL CREDITS	TOTAL MARKS
				HRS PER WEEK	CREDITS	TERM WORK				THEORY PAPER		HRS PER WEEK	CREDITS	LAB WORK	PRACTICAL EXAM/VIVA			
						QUIZ/ASSIGNMENT	MID TERM TEST*		TOTAL	MARKS	DURATION				MARKS	DURATION		
							I	II										
1	7406	401	MEASUREMENTS AND METROLOGY	4	4	10	10	10	30	70	03 Hrs.	4	2	20	30	03 Hrs.	6	150
2	7407	402	STRENGTH OF MATERIALS	4	4	10	10	10	30	70	03 Hrs.	4	2	20	30	03 Hrs.	6	150
3	7543	403	INDUSTRIAL PRODUCTION TECHNOLOGY -II	3	3	10	10	10	30	70	03 Hrs.	4	2	20	30	03 Hrs.	5	150
4	7409	411	MATERIAL HANDLING SYSTEM OR	3	3	10	10	10	30	70	03 Hrs.	0	0	0	0	0	3	100
	7410	412	COMPUTER INTEGERATED MANUFACTURING															
5	7544	421	ADVANCED SENSORS FOR ENGGINEERING APPLICATIONS AND NDT OR	3	3	10	10	10	30	70	03 Hrs.	0	0	0	0	0	3	100
	7545	422	TOTAL QUALITY MANAGEMENT															
6			MINOR PROJECT	0	0	0	0	0	0	0	0	4	2	20	30	03 Hrs.	2	50
7			ESSENCE OF INDIAN KNOWLEDGE AND TRADITION	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8			LIBERARY /SEMINAR/VISITS etc.	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
TOTAL				19	17				150	350		17	8	80	120		25	700

NOTE - (1)* Two Best,out of Three Mid Term Tests (Progressive Tests) Marks should be entered here.

GRAND TOTAL OF CREDITS	GRAND TOTAL OF MARKS
25	700

DIPLOMA WING
RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL
DIPLOMA IN PRODUCTION ENGINEERING (P05)

SEMESTER IV

COURSE TITLE	:	MEASUREMENTS AND METROLOGY
PAPER CODE	:	7406
SUBJECT CODE	:	401
TREORY CREDITS	:	04
PRACTICAL CREDITS	:	00

Course Objectives:

- To study advances in technology, measurement techniques, types of instrumentation devices, innovations, refinements.
- To study the principles of instrumentation, transducers & measurement of non-electrical parameters like temperature, pressure, flow, speed, force and stress.

Course Content:

UNIT-I: 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.

Measuring instruments: Introduction; Thread measurements: Thread gauge micrometre; 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, Talysurf surface roughness tester; Co-ordinating measuring machine.

Unit-II: Transducers and Strain gauges: Introduction; Transducers: Characteristics, classification of transducers, two coil self-inductance transducer, Piezoelectric transducer; Strain Measurements: Strain gauge, Classification, mounting of strain gauges, Strain gauge rosettes-two and three elements.

Measurement of force, torque, and pressure: Introduction; Force measurement: Spring Balance, Proving ring, Load cell; Torque measurement: Prony brake, Eddy current, Hydraulic dynamometer; Pressure measurement: Mcloed gauge.

Unit-III: 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.

Miscellaneous measurements: Humidity measurement: hair hygrometer; Density measurement: hydrometer; Liquid level measurement: sight glass, Float gauge; Biomedical measurement: Sphygmo monometer.

Unit-IV: Limits, Fits & Tolerances: Concept of Limits, Fits, and Tolerances; Selective Assembly; Interchangeability; Hole And Shaft Basis System; Taylor's Principle; Design of Plug; Ring Gauges; IS 919-1993 (Limits, Fits & Tolerances, Gauges} IS 3477-1973; concept of multi gauging and inspection.

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 (With Numerical on Setting of Angle Gauges).

Screw thread Measurements: ISO grade and fits of thread; Errors in threads; Pitch errors; 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.

Unit-V: Gear Measurement and Testing: Analytical and functional inspection; Rolling test; Measurement of tooth thickness (constant chord method); Gear tooth vernier; Errors in gears such as backlash, runout, composite.

Machine tool testing: Parallelism; Straightness; Squareness; Coaxiallity; roundness; run out; alignment testing of machine tools as per IS standard procedure.

Reference Books:

1. Mechanical measurements – Beckwith Marangoni and Lienhard, Pearson Education, 6th Ed., 2006.
2. Metrology & Measurement – Anand K Bewoor,Vinay kulakarni, Tata McGraw Hill, New Delhi, 2009
3. Principles of Industrial instrumentation and control systems – Channakesava. R. Alavala, DELMAR cenage learning, 2009.
4. Principles of Engineering Metrology – Rega Rajendra, Jaico publishers, 2008
5. Dimensional Metrology – Connie Dotson, DELMAR, Cenage learning, 2007
6. Instrumentation measurement and analysis – B.C. Nakara, K.K. Chaudary, second edition, Tata cgraw Hill, 2005.
7. Engineering Metrology – R.K. Jain, Khanna Publishers, New Delhi, 2005.
8. A text book of Engineering Metrology – I.C. Gupta, Dhanpat Rai and Sons, New Delhi, 2005
9. Metrology for Engineers – J.F.W. Galyer and C. R. Shotbolt, ELBS
10. Engineering Metrology – K. J. Hume, Kalyani publishers

Course outcomes

At the end of the course, the student will be able to:

CO1	Define accuracy, precision, calibration, sensitivity, repeatability and such relevant terms in metrology.
CO2	Distinguish between various types of errors.
CO3	Understand the principle of operation of an instrument and select suitable measuring device for a particular application.
CO4	Appreciate the concept of calibration of an instrument.
CO5	Analyze and interpret the data obtained from the different measurements processes and present it in the graphical form, statistical form.

MEASUREMENTS AND METROLOGY LAB

Course Learning Objectives

- To understand techniques for precise measurement of the dimensions of various objects and shapes.

Course Content:

I. LINEAR MEASUREMENTS:

1. Determine the thickness of ground MS flat to an accuracy of 0.02mm using Vernier caliper.

2. Determine the diameter and length of cylindrical objects to an accuracy of 0.02mm using vernier caliper.

3. Determine the inside diameter of a bush component to an accuracy of 0.02 using Vernier caliper.

4. Determine the diameter of a cylindrical component to an accuracy of 0.01mm using micrometer and check the result with digital micrometer

5. Determine the height of gauge block or parallel bars to an accuracy of 0.02mm using Vernier height gauge.

6. Determine the depth of a blind bore component to an accuracy of 0.02mm using vernier depth gauge.

7. Determine the thickness of ground MS plates using slip gauges.

II. ANGULAR MEASUREMENTS:

8. Determine the angle of V-block, Taper Shank of Drill and Dovetails in mechanical components using universal bevel protractor.

9. Determine the angle of machined surfaces of components using sine bar with slip gauges.

III. GEOMETRIC MEASUREMENT

10. Measure the geometrical dimensions of V-Thread

11. Measure the geometrical dimensions of spur gear.

IV. MACHINE TOOL TESTING

Geometrical Test: Position of machine tool components and displacement of machine tool components relative to one another is checked.

The instruments required for Geometrical tests are Dial Gauge, test mandrel, Straight edge, Squareness, sprit level.

- Test for level of installation of machine tool in Horizontal and Vertical Planes.
- Test for Flatness of machine bed and for straightness and parallelism of bed ways on bearing surface.
- Test for perpendicular of guide ways to other guide ways or bearing surface.
- Test for true running of the main spindle and its axial movements.
- Test for parallelism of spindle axis to guide ways or bearing surfaces.
- Test for line of movements of various members like spindle and table cross slides.
- Practical test in which some test pieces are done and their accuracy and finish is checked.

Reference Books:

1. Measurement System (Application and Design) – Ernest O Doebelin.
2. Mechanical and Industrial measurements- R. K. Jain
3. Engineering precision metrology – R. C. Gupta
4. A text book of engineering of metrology- I. C. Gupta.
5. Hand book of Industrial Metrology – ASME

Course outcomes:

At the end of the course, the student will be able to:

CO1	Measure various component of linear measurement using Vernier calipers and Micrometer
CO2	Measure various component of angle measurement using sine bar and bevel Protractor
CO3	Measure the geometrical dimensions of V-thread and spur gear

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DIPLOMA WING
RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL
DIPLOMA IN PRODUCTION ENGINEERING (P05)

SEMESTER IV

COURSE TITLE	:	STRENGTH OF MATERIALS
PAPER CODE	:	7407
SUBJECT CODE	:	402
TREORY CREDITS	:	04
PRACTICAL CREDITS	:	02

Course Objectives:

- To understand the concept of Simple Stresses and Strains.
- To understand the concept of Strain Energy.
- To understand the concept of Shear Force and Bending Moment Diagrams.
- To understand the concept of Theory of Simple Bending and Deflection of Beams.
- To understand the concept of Torsion in Shafts and Springs.
- To understand the concept of Thin Cylindrical Shells.

Course Content:

UNIT-I: Simple Stresses and Strains: Types of forces; Stress, Strain and their nature; Mechanical properties of common engineering materials; Significance of various points on stress – strain diagram for M.S. and C.I. specimens; Significance of factor of safety; Relation between elastic constants; Stress and strain values in bodies of uniform section and of composite section under the influence of normal forces; Thermal stresses in bodies of uniform section and composite sections; Related numerical problems on the above topics.

Strain Energy: Strain energy or resilience, proof resilience and modulus of resilience; Derivation of strain energy for the following cases: i) Gradually applied load, ii) Suddenly applied load, iii) Impact/ shock load; Related numerical problems.

Unit-II: Shear Force & Bending Moment Diagrams: Types of beams with examples: a) Cantilever beam, b) Simply supported beam, c) Over hanging beam, d) Continuous beam, e) Fixed beam; Types of Loads – Point load, UDL and UVL; Definition and explanation of shear force and bending moment; Calculation of shear force and bending moment and drawing the S.F and B.M. diagrams by the analytical method only for the following cases: a) Cantilever with point loads, b) Cantilever with uniformly distributed load, c) Simply supported beam with point loads, d) Simply supported beam with UDL, e) Over hanging beam with point loads, at the centre and at free ends, f) Over hanging beam with UDL throughout, g) Combination of point and UDL for the above; Related numerical problems.

Unit-III: Theory of Simple Bending and Deflection of Beams: Explanation of terms: Neutral layer, Neutral Axis, Modulus of Section, Moment of Resistance, Bending stress, Radius of curvature; Assumptions in theory of simple bending; Bending Equation $M/I = \sigma/Y = E/R$ with derivation; Problems involving calculations of bending stress, modulus of section and moment of resistance; Calculation of safe loads and safe span and dimensions of cross- section; Definition and explanation of deflection as applied to beams; Deflection formulae without proof for cantilever and simply supported beams with point load and UDL only (Standard cases only); Related numerical problems.

Unit-IV: Torsion in Shafts and Springs: Definition and function of shaft; Calculation of polar M.I. for solid and hollow shafts; Assumptions in simple torsion; Derivation of the equation $T/J=f_s/R=G\theta/L$; Problems on design of shaft based on strength and rigidity; Numerical Problems related to comparison of strength and weight of solid and hollow shafts; Classification of springs; Nomenclature of closed coil helical spring; Deflection formula for closed coil helical spring (without derivation); stiffness of spring; Numerical problems on closed coil helical spring to find safe load, deflection, size of coil and number of coils.

Unit-V: Thin Cylindrical Shells: Explanation of longitudinal and hoop stresses in the light of circumferential and longitudinal failure of shell; Derivation of expressions for the longitudinal and hoop stress for seamless and seam shells; Related numerical Problems for safe thickness and safe working pressure.

Reference Books:

1. Strength of Materials – D.S. Bedi, Khanna Book Publishing Co. (P) Ltd., Delhi, 2017
2. Strength of Materials – B.C.Punmia, Ashok Kumar Jain & Arun Kumar Jain, Laxmi Publications, New Delhi, 2013
3. Strength of Materials – S. Ramamrutham, Dhanpat Rai & Publication New Delhi
4. Strength of Materials – R.S. Khurmi, S.Chand Company Ltd. Delhi
5. A Text Book strength of Material– R.K. Bansal, Laxmi Publication New Delhi

Course outcomes:

At the end of the course, the student will be able to:

CO1	Compute stress and strain values and find the changes in axial, lateral and volumetric dimensions of bodies of uniform section and of composite section under the influence of normal forces.
CO2	Calculate thermal stresses, in bodies of uniform section and composite sections.
CO3	Define resilience, proof – resilience and modulus of resilience and obtain expressions for instantaneous stress developed in bodies subjected to different loads.
CO4	Compute shear force and bending moment at any section of beam and draw the S.F. & B.M diagrams of for UDL and Point loads.
CO5	Calculate the safe load, safe span and dimensions of cross section.
CO6	Compare strength and weight of solid and hollow shafts of the same length and material and compute the stress and deflection of the closed coil helical spring.

STRENGTH OF MATERIALS LAB

Course Learning Objectives

- Define the various properties of materials such as: Yield stress, Ultimate stress, percentage elongation, Young's Modulus.
- Appreciate the importance of various mechanical properties such as hardness, impact strength.

Course Content:

Strength of Materials Laboratory Exercises

1. Test on Ductile Materials:

Finding Young's Modulus of Elasticity, yield points, percentage elongation and percentage reduction in area, stress strain diagram plotting, tests on mild steel.

2. Hardness Test:

Determination of Rockwell's Hardness Number for various materials like mild steel, high carbon steel, brass, copper and aluminum

3. Torsion test:

Torsion test on mild steel – relation between torque and angle of twist-determination of shear modulus and shear stress

4. Impact test:

Finding the resistance of materials to impact loads by Izod test and Charpy test

5. Tests on springs of circular section:

Determination of modulus of rigidity, strain energy, shear stress and stiffness by load deflection method (Open / Closed coil spring)

6. Shear test:

Single or double shear test on M.S. bar to finding the resistance of material to shear load

Reference Books:

1. Strength of materials by R.S. Khurmi.
2. Strength of Materials by D.S. Bedi.
3. Applied Mechanics & Strength of Materials by S. Ramamrutham.

Course outcomes:

At the end of the course, the student will be able to:

CO1	Determine the various types of stress and plot the stress strain diagram for mild steel.
CO2	Determine the Rockwell hardness for various materials.
CO3	Determine the torsion, bending, impact and shear values of given materials

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DIPLOMA WING
RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL
DIPLOMA IN PRODUCTION ENGINEERING (P05)

SEMESTER IV

COURSE TITLE	:	INDUSTRIAL PRODUCTION TECHNOLOGY-II
PAPER CODE	:	7543
SUBJECT CODE	:	403
TREORY CREDITS	:	03
PRACTICAL CREDITS	:	02

Course Learning Objectives:

- To understand basic production processes and technologies of relevance to the manufacturing industry and related sectors, particularly in the production, process and development areas.
- To select, operate and control the appropriate processes for specific applications and production processes, surface finishing processes and plastic processes.

Course Content:

UNIT-I: Theory of Metal Cutting: Theory of Metal Cutting: Cutting tool material-High carbon Steel-High Speed Steel-Stellites-Cemented carbides-ceramics-Composition and applications for the above-Single point cutting tool-nomenclature-tool life- Chip Breakers.

Drilling Machines: Drills-Flat drills-Twist drills-Nomenclature-Types of drilling machines-Bench type-Floor type-Radial type-Gang drill-Multi-spindle type-Principle of operation in drilling-Speeds and feeds for various materials-drilling holes-methods of holding drill bit-drill chucks-socket and sleeve-drilling-operation-reaming-counter sinking-counter boring-spot facing-tapping-deep hole drilling.

Boring Machines: Boring machines-horizontal and vertical types-fine boring machines-boring tools

UNIT-II: Reciprocating Machines: Planer: Types of planers-description of double housing planer specifications- principles of operation-drives-quick return mechanism-feed mechanism- work holding devices and special fixtures-types of tools various operation.

Shaper: Types of shapers-specifications-standard-plain-universal principles of opera- tions-drives-quick return mechanism-crank and slotted link-feed mechanism-work holding devic- es-Special fixture-various operations.

Slotter: Types of slotters-specifications-method of Operation-Whitworth quick return mechanism-feed mechanism-work holding devices-types of tools.

UNIT-III: Milling Machines: Types-column and knee type-plain-universal milling machine-vertical milling machine-specification of milling machines principles of operation-work and tool holding devices-arbor-stub arbor spring collet-adapter-milling cutters-cylindrical milling cutter-slitting cutter-side milling cutter-angle milling cutter-T-slot milling cutter-woodruff milling cutter-fly cutter-nomenclature of cylindrical milling cutter-milling process conventional milling-climb milling-milling operations-straddle milling-gang milling-vertical milling attachment.

Gear Generating Processes: Gear shaper-Gear hobbing-Principle of operation only-Gear finishing processes-Burnishing-Shaving-Grinding and Lapping; Gear materials-Cast iron, Steel, Alloy steels, Brass, Bronze, Aluminum and Nylon

UNIT-IV: Abrasive Process and Broaching: Abrasive Process: Types and classification-specifications-rough grinding – pedestal grinders- portable grinders- belt grinders-precision grinding cylindrical grinder- centerless grinders – surface grinder- tool and cutter grinder - planetory grinders-principles of operations-grinding wheels abrasives- natural and artificial diamond wheels-types of bonds-grit, grade and structure of wheels-wheel shapes and sizes-standard marking systems ofgrinding wheels-selection of grinding wheel-mounting of grinding wheels-Dressing and Truing of wheels-Balancing of grinding wheels.

Broaching: Types of broaching machine-horizontal, vertical and continuous broaching-principles of operation-types of broaches classification- broach tool nomenclature-broaching operations-simple examples

UNIT-V: Jigs & Fixtures: Definitions and concept of Jig and fixture-Advantages of jigs and fixtures-elements of jigs and fixtures-locating devices-'V' locators-fixed stop locators-adjustable stop locators-clamping devices strap clamp, screw clamp-cam action clamp-types of jigs-box drill jig indexing drill jig-types of fixtures-keyway milling fixture-string milling fixture.

Press Working: Types of presses-mechanical and hydraulic presses press tools and accessories-press working operations-bending operations angle bending-channel bending -curling-Drawing-shearing operations - blanking, piercing, trimming-notching-lancing-shaving-parting off.

Non-Conventional Machining Processes: Construction, working and applications of Ultrasonic machining-chemical machining-electro chemical grinding-electrical discharge machining-plasma arc machining-LASER machining-Advantages – Disadvantages.

Reference Books:

1. Elements of Workshop Technology- Vol. I & II, Hajra Choudry & Battacharya, , Ed. 11, published by Media Promoters and Publishers Pvt. Ltd.,
2. Production Technology, HMT, , Edn. 18, Tata McGraw Hill Publishing Co.
3. Manufacturing process, Myro N Begman, Edn. 5, Tata McGraw Hill Publishing Co. Ltd.
4. Workshop Tech Vol I,II, III, WAJ. Chapman, published by Viva Books Pvt. Ltd. New Delhi
5. Production processes, NITTTR, published by 5, Tata McGraw Hill Publishing Co. Ltd.

Course outcomes:

At the end of the course, the student will be able to:

CO1	Use the basic machine tools like lathe, drilling and milling.
CO2	Understand and select the gear cutting processes.
CO3	Demonstrate understanding of metal cutting principles and mechanism
CO4	Identify cutting tool geometry of single point and multipoint cutting tool
CO5	Demonstrate concepts and use of jigs and fixtures

INDUSTRIAL PRODUCTION TECHNOLOGY-II LAB

Course Learning Objectives:

- Operate various machines like lathe, shaper etc.
- Perform plain turning, taper turning, and screw cutting etc. on lathe machine.
- Perform machining operations on shaper.
- Perform shaping operations

Course Content:

1.0 DRILLING EXERCISE (Three models)

1.1 Preparation of model with two or three different sizes holes for different materials

1.2 Preparation models of different holes by maintain minimum distance between them

2.0 SHAPING SQUARE (Three models)

2.1 Hexagon on a round bar, key ways, grooves splines,

2.2 Shaping step block cut dovetail to angles 60, 90, 120 degrees.

3.0 SIMPLE PLANNING EXERCISE CUTTING 'T' SLOTS (One model)

4.0 PRACTICES ON MILLING MACHINE (Three models)

4.1 Milling-square-hexagon from round bars with indexing and without indexing

4.2 Milling key ways of different types

4.3 Generation of spur gear teeth on a round bar.

4.4 Milling flutes of a twist drill

4.5 Milling splines and T-slots

5.0 MOUNTING BALANCING AND DRESSING OF GRINDING WHEELS

5.1 Grinding flat surface on a surface grinder using magnetic chuck and clamping devices

5.2 Cylindrical grinding of external surface and internal surface using universal grinding machines

5.3 Grinding Cutting tools to the required angles

5.4 Grinding of milling cutters etc, on a tool and cutter grinder

6.0 LATHE OPERATIONS

6.1 Facing, Step turning & Chamfering

6.2 Step turning & Groove cutting

6.3 Step turning & Taper turning

6.4 Step turning & Knurling

6.5 Step turning &Thread cutting (L.H)

6.6 Bush: Turning & Drilling

Reference Books:

1. Elements of Workshop Technology- Vol. I & II, Hajra Choudry & Battacharya, Ed. 11th, Media Promoters and Publishers Pvt. Ltd.
2. Production Technology, HMT, , Ed. 18th, Tata McGraw Hill Publishing Co. Manufacturing Process, Myro N Begman, Ed. 5th, Tata McGraw Hill Publishing Co. Ltd.

Course outcomes:

At the end of the course, the student will be able to:

CO1	Identify the parts of a center lathe and types of tools used.
CO2	Make use of lathe for machining various cylindrical components
CO3	Identify the parts of a drilling machine and types of tools used.
CO4	Make use of drilling machine for drilling, reaming and tapping operations
CO5	Make use of drilling machine for counter sink and counter bore operations

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DIPLOMA IN PRODUCTION ENGINEERING (P05)

SEMESTER IV

COURSE TITLE	:	MATERIAL HANDLING SYSTEM
PAPER CODE	:	7409
SUBJECT CODE	:	411
TREORY CREDITS	:	03
PRACTICAL CREDITS	:	00

Course Objectives:

- To know the operational features of the material handling equipment & its practical applications.
- To understand, select, operate and maintain the material handling equipments.
- To understand different material handling processes used in industries.
- To understand & appreciate safety instrumentation for equipment.

Course Content:

UNIT-I: Introduction to Material Handling System: Main types of Material handling equipments & their applications; Types of load to be handled; Types of Movements; Methods of stacking, loading & unloading systems; Principles of Material Handling Systems; Modern trends in Materials handling.

UNIT-II: Hoisting Machinery & Equipments: Construction, Working & Maintenance of different types of hoists such as Lever operated hoist, Portable hand chain hoist, Differential hoists, Worm geared and Spur geared hoists, Electric & Pneumatic hoists, Jumper; Construction, Working & Maintenance of different types of cranes such as Rotary cranes, Trackless cranes, Mobile cranes, Bridge cranes, Cable cranes, Floating cranes & Cranes traveling on guide rails; Construction, Working & Maintenance of Elevating equipments such as Stackers, Industrial lifts, Freight elevators, Passenger lifts, and Mast type's elevators, Vertical skip hoist elevators.

UNIT-III: Conveying Machinery: Construction, Working & Maintenance of Traction type conveyors such as Belt conveyors, Chain conveyors, Bucket elevators, Escalators; Construction, Working & Maintenance of Traction less type conveyors such as Gravity type conveyors, Vibrating & Oscillating conveyors, Screw conveyors, Pneumatic & Hydraulic conveyors, Hoppers gates & Feeders.

Surface Transportation Equipment: Construction, Function, Working of Trackless equipment such as Hand operated trucks, Powered trucks, Tractors, Automatic Guided vehicle, Industrial Trailers; Construction, Function, Working of Cross handling equipment such as Winches, Capstans, Turntables, Transfer tables, Monorail conveyors.

UNIT-IV: Components of Material Handling Systems: Flexible hoisting appliances such as Welded load chains, Roller chains, Hemp ropes, Steel wire ropes, Fastening methods of wire & chains, Eye bolts, Lifting tackles, Lifting & Rigging practices; Load handling attachments: a) Various types of hooks-Forged, Triangular eye hooks, Appliances for suspending hooks b) Crane grab for unit & piece loads c) Electric lifting magnet, vacuum lifter. d) Grabbing attachment for loose materials e) Crane attachment for handling liquids/molten metals; Construction & Working of Arresting gear & Brakes; Construction & use of electromagnetic shoe brakes, Thruster operated shoe brakes, Control brakes.

UNIT-V: Mechanism used in Material Handling Equipment: Steady state motion; Starting & stopping of motion in following mechanisms: Hoisting mechanism, Lifting Mechanism, Traveling Mechanism, Slewing Mechanism, Rope & chain operated Cross- Traverse Mechanism.

Selection of Material Handling Equipment: Factors affecting choice of material handling equipment such as Type of loads, Hourly capacity of the unit, Direction & length of travel, Methods of stocking at initial, final & intermediate points, Nature of production process involved, Specific load conditions & Economics of material handling system.

Reference Books:

1. Material handling (Principles & Practice) – Allegri T. H., CBS Publisher, New Delhi.
2. Plant Layout & Materials Handling – Apple J. M., JohnWiley Publishers.
3. Material Handling Equipment – N. Rundenko, Peace Publisher, Moscow.
4. Material Handling Equipment – M. P. Alexandrov, MIR Publisher, Moscow.
5. Material Handling Equipment – Y. I. Oberman, MIR Publisher, Moscow.

Course outcomes

At the end of the course, the student will be able to:

CO1	Understand constructional & operational features of various materials handling systems.
CO2	Identify, compare & select proper material handling equipment for specified applications.
CO3	Know the controls & safety measures incorporated on material handling equipment.
CO4	Appreciate the role of material handling devices in mechanization & automation of industrial process.
CO5	Understand & appreciate safety instrumentation for equipment

DIPLOMA WING
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DIPLOMA IN PRODUCTION ENGINEERING (P05)

SEMESTER IV

COURSE TITLE	:	COMPUTER INTEGRATED MANUFACTURING
PAPER CODE	:	7410
SUBJECT CODE	:	412
TREORY CREDITS	:	03
PRACTICAL CREDITS	:	00

Course Learning Objectives:

- To understand different types of manufacturing available today such as the Special manufacturing System, the Manufacturing Cell, and the Flexible Manufacturing System (FMS).
- To learn the fundamentals of computer assisted numerical control programming and programming languages.
- To learn the concepts of Computer Integrated Manufacturing and Management System and automated flow lines.
- To learn the guidelines and criteria for implementing CAD/CAM Systems and associated software for design, Manufacturing, and a common CAD/CAM data base organized to serve both design and manufacturing.

Course Content:

UNIT-I: Concept of Computer Integrated Manufacturing (CIM); Basic components of CIM; Distributed database system; distributed communication system, computer networks for manufacturing; future automated factory; social and economic factors.

Unit-II: Computer Aided Design (CAD): CAD hardware and software; product modelling, automatic drafting; engineering analysis; FEM design review and evaluation; Group Technology Centre.

Unit-III: Computer Aided Manufacturing (CAM), Computer assisted NC part programming; Computer assisted robot programming; computer aided process planning (CAPP); computer aided material requirements planning (MRP)

Unit-IV: Computer aided production scheduling; computer aided inspection planning; computer aided inventory planning, Flexible manufacturing system (FMS); concept of flexible manufacturing.

Unit-V: Integrating NC machines, robots, AGVs, and other NC equipment; Computer aided quality control; business functions, computer aided forecasting; office automation

Reference Books:

1. CAD, CAM, CIM by P. Radhakrishnan and S. Subramanyan, New Age International Publishers.
2. Computer Integrated Manufacturing by Paul G. Rankey, Prentice Hall.
3. Robotics Technology and Flexible Automation – S.R. Deb, TMH

Course outcomes:

At the end of the course, the student will be able to:

CO1	Understand basic components and networks involved in CIM.
CO2	Understand hardware, software and product modeling at industry level
CO3	Understand process planning and program coding of task.
CO4	Design a manufacturing cell and cellular manufacturing system.
CO5	Design automated material handling and storage systems for a typical production system.

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DIPLOMA WING
RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL
DIPLOMA IN PRODUCTION ENGINEERING (P05)

SEMESTER IV

COURSE TITLE	:	ADVANCED SENSORS FOR ENGINEERING APPLICATIONS AND NDT
PAPER CODE	:	7544
SUBJECT CODE	:	421
TREORY CREDITS	:	03
PRACTICAL CREDITS	:	00

Course Learning Objectives:

- To learn the latest developments in the field of Sensor technology and instrumentation.
- To understand the concept of non-destructive testing and to describe the various types of NDT tests carried out on components.
- To apply newly introduced techniques to sensor design and fabrication.

Course Content:

UNIT-I: Advanced Sensors: Introduction, semiconductor sensors: metal oxide semiconductors, Hall elements; Silicon sensors: Silicon Planar Technology, Silicon sensors for sensing radiation, mechanical, magnetic and chemical signals.

Unit-II: IC **sensors, membrane types of sensors; Optical sensors:** Lasers, photo-detectors, optical fibre; Microsensors for sensing thermal, radiation, mechanical, magnetic and chemical signals; Smart sensors.

Unit-III: Non Destructive Testing: Introduction, classification of NDT techniques; Visual examination: Bore-scopes, video devices; Magnetic particle testing: Operating principle, magnetising technique.

Unit-IV: Liquid Penetrating technique: Principle, process description; Ultrasonic Testing: Definition, advantages and applications, inspection methods; Radiography: Electromagnetic radiation sources, process description.

Unit-V: Thermography: Infrared theory, contact, non-contact methods; Accoustic emission testing, eddy current testing; Leak testing: Bubble emission testing, Air leak testing; Case studies on defects in casting, welding.

Reference Books:

1. Non-Destructive Testing by Warren J.Mcgomnagle, McGrawhill.
2. Non-Destructive Testing by Baldev Raj et. al.
3. Sensors & Transducers by D. Patranobis, TMH

Course outcomes:

At the end of the course, the student will be able to:

CO1	Select the right sensor for a given application
CO2	Design basic circuit building blocks and Simulate, synthesize, and layout a complete sensor or sensor system
CO3	Understand the theory of non-destructive testing methods is used
CO4	Determine the type of requirement of non-destructive test
CO5	Distinguish between the various NDT test as Ultrasonic and Eddy current methods

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DIPLOMA WING
RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL
DIPLOMA IN PRODUCTION ENGINEERING (P05)

SEMESTER IV

COURSE TITLE	:	TOTAL QUALITY MANAGEMENT
PAPER CODE	:	7545
SUBJECT CODE	:	422
TREORY CREDITS	:	03
PRACTICAL CREDITS	:	00

Course Learning Objectives:

- To introduce the main principles of business and social excellence, to generate knowledge and skills of students to use models and quality management methodology for the implementation of total quality management in any sphere of business and public sector.

Course Content:

UNIT-I: Basic concepts: Definitions and history of quality control; Quality function and concept of quality cycle; Quality policy and objectives. Economics of quality and measurement of the cost of quality. Quality considerations in design.

Unit-II: Process control: Machine and process capability analysis; Use of control charts and process engineering techniques for implementing the quality plan.

Unit-III: Acceptance Sampling: Single, double and multiple sampling, lot quality protection, features and types of acceptance sampling tables, acceptance sampling of variables and statistical tolerance analysis.

Unit-IV: Quality education: principles of participation and participative approaches to quality commitment.

Unit-V: Emerging concepts of quality management: Taguchi's concept of off-line quality control and Ishikawa's cause and effect diagram.

Reference Books:

1. Total Quality Management, M.P. Poonia & S.C. Sharma, Khanna Publishing House, 2018.
2. Total Quality Management – An Introductory Text by Paul James, Prentice Hall
3. Quality Control and Applications by Housen & Ghose
4. Industrial Engineering Management by O.P. Khanna

Course outcomes:

At the end of the course, the student will be able to:

CO1	Develop an understanding on quality management philosophies and frameworks
CO2	Develop in-depth knowledge on various tools and techniques of quality management
CO3	Learn the applications of quality tools and techniques in both manufacturing and service industry
CO4	Develop analytical skills for investigating and analysing quality management issues in the industry and suggest implement able solutions to those.
CO5	Emerging concepts for quality and Taguchi optimization technique for off-line

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DIPLOMA WING

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

DIPLOMA IN PRODUCTION ENGINEERING (P05)

SEMESTER - IV

COURSE TITLE	:	MINOR PROJECT
PAPER CODE	:	--
SUBJECT CODE	:	--
TREORY CREDITS	:	00
PRACTICAL CREDITS	:	02

MINOR PROJECT –

Evaluation is based on work done, quality of report performance in viva-voce, presentation etc.

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DIPLOMA WING
RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA,BHOPAL
DIPLOMA IN PRODUCTION ENGINEERING (P05)

SEMESTER - IV

COURSE TITLE	:	ESSENCE OF INDIAN KNOWLEDGE AND TRADITION
PAPER CODE	:	--
COURSE CODE	:	--
TREORY CREDITS	:	00
PRACTICAL CREDITS	:	00

Course Content:

Basic Structure of Indian Knowledge System:

(i) वेद, (ii) उन्नवेद (आयवेद, धनुवेद गन्धवेद स्थान्नत्य आदद) (iii) वेदांग (शिक्षा कल्न ननरूत व्याकरण ज्योनतष छांद),

(iv) उन्नाइग (धर्म रीरांसा, नुराण, तकमिस्त्र)

- Modern Science and Indian Knowledge System
- Yoga and Holistic Health care
- Case Studies.

SUGGESTED TEXT/REFERENCE BOOKS:

S. No.	Title of Book	Author	Publication
1.	Cultural Heritage of India-Course Material	V. Sivaramakrishna	Bharatiya Vidya Bhavan, Mumbai, 5th Edition, 2014
2.	Modern Physics and Vedant	Swami Jitatmanand	Bharatiya Vidya Bhavan
3.	The wave of Life	Fritzof Capra	
4.	Tao of Physics	Fritzof Capra	
5.	Tarkasangraha of Annam Bhatta, Inernational	V N Jha	Chinmay Foundation, Velliarnad, Amaku,am
6.	Science of Consciousness Psychotherapy and Yoga Practices	RN Jha	Vidyanidhi Prakasham, Delhi, 2016

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