



MATS UNIVERSITY

ARANG, RAIPUR (C.G.)



Scheme of Teaching & Examination

V - Semester

S.N.	code	Subject	Periods per week			Scheme of marks		Total Credit
			L	T	P	ESE	IM	
1.	DP540	Advance Manufacturing Process	4	0	-	70	30	4
2.	DP541	CAD CAM & Automation	4	0	-	70	30	4
3.	DP542	Design of Machine Elements	3	2	-	70	30	4
4.	DP543	Automobile Engineering	4	0	-	70	30	4
5.	DP544X	Professional Elective – I	3	0	-	70	30	3
6.	DP545	Machine Design Lab	-	-	2	30	20	1
7.	DP546	Automobile Engineering Lab	-	-	2	30	20	1
8.	DP547	Advance Manufacturing Lab	-	-	2	30	20	1
9.	DP548	CAD CAM LAB	-	-	2	30	20	1
10.	DP549	Vocational Training & Evaluation			2	30	20	1
Total			18	2	10	540	260	24

L – Lecture, T – Tutorial, ESE – End Semester Examination,

P – Practical, IM – Internal Marks (Include Class Test & Teacher's Assessments)

Professional Elective:

DP5441	Tool Engineering
DP5442	Industrial Management
DP5443	Power Plant Engineering
DP5444	Mechatronics
DP5445	Estimation and Costing

FIFTH SEMESTER
SUBJECT- ADVANCE MANUFACTURING PROCESS
CODE- DP540

UNIT – I

Competitive Aspects of Manufacturing Processes Selection of Material, product, design and quality of material, substitution of material, selection of manufacturing process, process capabilities, manufacturing considerations. Heat treatment of steel, Designation of steel.

UNIT – II

Casting Alloys: Ferrous, Non ferrous, properties, processes – Ingot, shapes, expendable mould – permanent pattern, expendable mould – expendable pattern, permanent, centrifugal, melting practices, design considerations, quality assurance, foundry mechanization.

UNIT – III

Bulk Deformation Process Rolling - Classification, products, processing sequence, mill types, mill line equipments, accessories for flat and shape rolling, variables, load, torque, power calculations, rolling mill controls, defects – causes and remedies. **Forging** - Types, tools and dies, equipment, recent trend in forging, design considerations, defects, causes and remedies. Press working - Material properties – Formabilities, yield point phenomenon, Anisotropy, metals, shearing process – types, forces, finish blanking, equipments, bending-stresses and spring back, methods, flanging and necking, special processes – spinning, bulging, peen forming, stretch forming, deep drawing dies, design considerations in metal working. **Extrusion** - Process, tooling, analysis and variables. Wire and tube drawing - Operations and Analysis.

UNIT - IV

Joining Process Welding – Solid state bonding – cold, diffusion, forge friction, liquid state – Joint, weldability, weld quality, material, resistance, arc, thermal, high energy beam. Liquid solid – brazing soldering. Recent development in welding – under water, high pressure vessel etc. Inspection & testing of welded joints. Adhesive bonding – Types of adhesive, adhesive systems, surface preparation, application, design, process capability, welding of plastics, thermal cutting.

UNIT – V

Advanced Machining Processes Non traditional machining – Processes, Process parameters and comparative study of AJM, ECM USM, EDM, LBM, EBM, PAM processes. Rapid Prototyping – Processes, process parameters, capability and products, application of various methods. Fabrication of Micro electronic devices – Process sequence, basic techniques, thick and thin film techniques, application.

TEXT BOOKS

1. Manufacturing Engineering Technology – S. Kalpakjian & S.C. Schmid – Pearson Education – New Delhi
2. Introduction to Manufacturing Processes – J.A. Schey – McGraw Hill, New York
- REFERENCE BOOKS 1. Manufacturing Science – A. Ghosh & A. Mallik – Affiliated East West Press, Delhi 2. Mechanical Metallurgy – G.E. Dieter – McGraw Hill, New York
3. Principles of Manufacturing Material and Processes – J.S. Cambell – TMH, New Delhi

FIFTH SEMESTER
SUBJECT- CAD CAM & AUTOMATION
CODE- DP541

UNIT-I Introduction of CAD :

Computer Aided Drafting Concept, List of various CAD Software, Components of Auto CAD 2000 window such as Tool bar, standard tool bar, menu bar, **Drawing using AUTO CAD** : Setting drawing units, limits, Grid, and snap searing the life opening on existing file, Drawing basic activities like Line, Circle, Arc, and Polygon etc, Using object Snap like END POINT, MID POINT, INTERSECTION, and CENTER POINT etc.

UNIT - II Editing Viewing Drawing

Selecting objects selection set with its option Like, Pick box, Window, Crossing, Previous, Add Remove, Editing commands like Erase, Copy, Array, Mirror, Break, Fillet etc., Display Command like Zoom All, 400 Previous 400 Extents etc., Concept of Layers. Concept of Block. **Dimensioning:** Types of dimension Linear, Horizontal, Vertical, Aligned, and Rotated, Text Style, Selecting Font Size, Alignment, TEXT:- Style key Line text, Multilane text, Text Style, Selecting font size, Alignment

UNIT – III Working with Three Dimensional Entities using Auto CAD

Right hand rule. Specifying coordinates using x,y,z Co-ordinates, using x,y,z filters, Entering cylindrical Co-ordinates, Entering Spherical Co-ordinates, Defining user-do ordinate system, world Co-ordinate system. **Solid Modeling** Concept of solid modeling, Creating predefined solid primitives such as box, core, cylinder, sphere, tours, and wedge, Construction a region using Region Command, Creasing and extruded solid, creasing reveled solid, Creating Composite solids using union, intersection and interfere commands, Creating cross sections of solid with section command. Using solid EDIT command with its option, Creating filets and chamfers on solids

UNIT – IV Printing Plotting Drawing

Selecting various parameters such as paper size, paper units, Drawing orientation, Plot Scale. Plot Offset, Plot area, and Print preview. **Introduction to Conventional Numerical Control** : Introduction, Basic components of NC system, The NC procedures, NC coordinates systems, NC motion control systems, Applications of Numerical control and potential applications of NC machine tools.

UNIT – V: Part Programming through Numerical Control:

Purpose of part programming, steps of part-programming, Difference between manual and computer assisted part programming, Difference between language based and CAD package based part programming. **Computer Based Numerical Control Systems** Classification of NC Controller technology as: - Computer numerical control. Direct numerical control. Adoptive control machining systems.

TEXT BOOKS

1. CAD/CAM Principles & Applications – P.N. Rao – TMH Publication
2. CAD/CAM Computer Aided Design & Manufacturing – Mikell P. Groover,
3. Concept and application of Finite element analysis, R D Cook, John Wiley

REFERENCES BOOKS

1. CAD/CAM Theory & Practice – Ibrahim Zied – TMH Publication
2. CAD/CAM – Surendra Kumar & A.K. Jha – Dhanpat Rai & Company

FIFTH SEMESTER
SUBJECT- DESIGN OF MACHINE ELEMENTS
CODE- DP542

UNIT – I: Introduction to machine design : Introduction to machine design, Basic design requirements for machine parts Factor influencing design of machine elements-strength, stiffness, light weight, wear resistance, minimum size, availability, processibility, safety, and compliance with standards, Basic design procedure, Types of failures, types of forces, types of loading, Common designation of materials, I.S. codes and values of tensile, compressive and shear strengths for commonly used materials. **Design of Joints:** Function and application of Cotter Joints, Knuckle Joints, Members subjected to tensile, compressive and shear load, Design of Cotter Joint, Design of Knuckle Joint.

UNIT – II: Design of Shaft and Axle: Introduction of pure bending, member subjected to bending Introduction to torsion equation, member subjected to torsion, Design of shaft and axle, Combined bending and twisting moment. **Design of Keys and Coupling:** Types of keys and its uses, Design of rectangular, square key and splines, Types of coupling, Design of flanged coupling, protective type flanged coupling.

UNIT – III: Design of Levers and Pulley Arm: Types of lever, bell crank lever, Design of bell crank lever, Design of C-clamp, Machine element subjected to bending-pulley arm, girder beam etc. Design of pulley arm, Materials of pulley arm. **Design of Helical and Leaf Spring:** Function of spring, Types of spring and its uses, Terminology used in spring design, Design of Helical spring, Design of semi-elliptical leaf spring, Introduction of helper spring, initial gap.

UNIT – IV : Belt and Rope Drives: Comparative advantages and disadvantages of belt and rope drive, Belt tension, tension ratio, Power transmitted by belt, Calculation of thickness and width of belt, Design of rope drive, Materials selection for belt and rope drive. **Riveted Joints:** Types of fasteners –temporary and permanent, Types of riveted joint-lap and butt joint, Definition of common terms like pitch, back pitch, diametric pitch, efficiency and margin, Types of failure in a riveted joints, Derivation of equation for checking the failure of a riveted joint, Design of a single and double row lap & butt joint for a given tensile load, Efficiency of riveted joint.

UNIT V: Design of Welded & Threaded Joints

Advantages of welding over rivetting, Types of welded joints, Strength of the butt -weld, types of fillet joints and strength of fillet joint, Types of threads and their proportions, Types of bolts, Proportion of nut -bolt dimensions, Design of bol Designation of threads as per I.S. codes. **Selection of Bearing;** Types of bearing, Radial and axial load, equivalent load, Static and dynamic capacity, Selection of bearing, Calculation of bearing life.

FIFTH SEMESTER
SUBJECT- AUTOMOBILE ENGINEERING
CODE- DP543

UNIT – 1 Introduction (Vehicle Layouts and Types)

Introduction to an automobile, History of the automobile, Types of automobiles, Layout of an automobile, Major components of the automobile, Functions of the automobile components, Layout of chassis and frames, classification of chassis. **Automobile Engines (Power Plant)** Types of Automobile Engines:- Petrol Engine, Diesel Engine, Gas Turbine, Rotary piston Engine Electric motor, Fuel cell (Hydro/Hydro methanol fuel cell)

Engines locations - front, rear and transverse under floor with their advantages and disadvantages Engine Constructional features :- Engine block, engine heads, crank case oil pan, cylinder liners, Gasket, combustion chambers with their types, piston, piston pin, gudgeon pin, connecting rod, crank shaft, cam shaft, valve & valve mechanism. valve timing , port timing diagram, timing gears, Inlet & exhaust manifolds, Exhaust mufflers, flywheel, inlet & exhaust ports of two stroke engine, concept of firing order in multi-cylinder engine.

Engine performance and testing – engine measurements, factors affecting engine power, engine rating and related factors, methods of determining the engine horse power, engine efficiency.

UNIT – 2 Fuel Systems for Petrol Engine

Introduction & fuel system for petrol engine, Gravity feed system, Fuel pump, Properties of air-fuel mixture, Mixture control devices, Simple carburettor & its limitations, modern carburettor like : cartor, solex arburettor, S.U. Carburettor, Concept of Petrol Injection & MPFI Petrol injection systems, [such as direct injection systems, port injection systems, throttle body injection etc, Mechanical and Electronic injection systems], Concept of supercharging & types of superchargers. **Fuel System for Diesel Engine**-Mixture requirements of diesel engine, Fuel injection systems such as Common rail fuel injection system, Individual pump fuel injection system, Construction and working of Fuel feed pump, Fuel injection pump, Fuel injector, Distributor type, rotary fuel injection pump.

UNIT –3 Auto-Electric System

Main Components of the Electrical System, Starter Generator, Alternator Type Generator, Ignition System, Distributor, Ignition Coil, Ignition Timing, Ignition Advance, Spark Plug, Electronic Ignition System, Operation of Electronic Ignition System, Electronic Switching Systems, Automobile Battery, Low-maintenance and Maintenance-free Batteries. **Transmission & Propeller Shaft** - Need and functions of transmission system ,Concept of various road resistances such as wind, Gradient, Resistance, Total resistance, Tractive- effort, Types of transmission, Types of gear boxes e.g. sliding mesh, constant mesh, synchromesh gear boxes, mathematical analysis of gear boxes, Gear shifting mechanisms. Epicyclic gear box, five speed gear box, .

UNIT- 4 Final Drive & Rear Axle

Introduction, Function & need of differential, Types of gears used in differential, Differential trouble diagnosis, Final drive, Construction and details of rear axle and forces acting on rear axle, Types such as semi floating, fully floating, Three quarter floating, Rear axle drives such as Hotchkiss type ,torque tube type etc.

Steering & Front Axle- Function of the steering system, Steering gears & Steering mechanism used in some Indian vehicles, Steering wheel & column, Front axle-Function & construction, Steering heads & steering geometry, Wheel alignment, Adjusting the steering angles, Ackerman linkage, Power steering, Under steering & over steering, Steering lock, Turning radius, Steering trouble shooting.

UNIT – 5 Brakes

Need & principle of braking system., Brake efficiency and stopping distance, Types of brakes as Mechanical brakes - drum and disc brakes, Hydraulic Brakes, Tandem Master cylinder, wheel cylinder, braking linkages, Self energized brakes, Floating-caliper brakes, Power brakes, Air brakes, Air hydraulic brakes, Emergency & Parking Brakes, Brake trouble shooting. **Wheels and Tyres** Types of Automobile Wheels, Tyres & its Types, Tyre Tread, Tyre Selection, Tyre Service Parameters, Tyre Maintenance

TEXT BOOKS

1. Automobile Engineering – Kripal Singh – Standard Publications
2. Automobile Engineering – G.B.S. Narang – Khanna Publishers

REFERENCE BOOKS

1. Automobile Engineering - Dr. N. K. Giri – Khanna Publishers
2. Automobile Engineering – K. R. Govindan – Anuradha Agencies

FIFTH SEMESTER
SUBJECT- TOOL ENGINEERING
CODE- DP5441

UNIT I: Introduction & Metal Cutting

Need of machine tool technology and its use, Material removal processes, Types of machine tools, Stages in cutting, factors affecting cutting, Types of chips, Continuous, discontinuous & built up edge (BUE), BUE formation condition and its effect upon surface finish. Definition of cutting force, feed force, radial force power requirement for each type of force, Tool geometry and influence of tool angles, Desirable properties of cutting tool. Material and their influences on the choice of tools materials. Primary and secondary function of cutting fluids and properties of cutting fluids commonly used, Types of cutting fluids. Cutting variables, tool wear and tool life, Tools life specifications, Taylor's tool life equation. Cutting speed calculation, Economics of metal cutting.

UNIT – II: Grinding and Finishing Processes

Definition of grinding and action in grinding, Types of abrasive materials and their properties, Bonding materials, Grinding wheel classification, Condition for selection of grinding wheels, Balancing of grinding wheels, Glazing, loading dressing and Trueing. Principles of working of grinding machines and functions of main parts, Types of grinding processes, Function of tool and work holding devices, feed arrangement, Table drive in surface and cylindrical grinders, Types of lubricants and coolants used in Grinding, Grinding defects, their remedy and safety practices, Definition of micro finishing, honing, lapping, super finishing methods, Equipments involved, materials used, Tolerances obtained and limitations, Application of honing and lapping processes.

UNIT – III: Machine Tools and Machine Tool Drives

Definition and Classification of machine tools, Requirement of machine tools, Drive systems stepped and step-less, drives, Advantages and limitations of the gear box drive, Function of feed box, types of feed gear boxes and advantages, Working principles of straight line motion, Control systems- multi handle, single lever and pre selective control systems.

UNIT – IV Installation and Testing of Machine Tools

Need for leveled concrete foundation, Effect of foundation on accuracy of the product and life of the machine, Effect of weight of machine, soil bearing capacity and loading pattern upon foundation, Industrial safety, Selection of proper lifting devices for levelling of machines after grouting, Instruments and aids required for testing the accuracy of machine, Load testing and product testing, Understanding of test chart and check list.

UNIT – V: Jigs and Fixtures

Definition and functions of jigs and fixtures, Location of components by dowel pins and buttons, bushes and restrainers screws, Design criteria for simple jigs and fixtures, Selections criteria for method of preparation of jigs and fixtures. **Unconventional Machining** : Need for unconventional methods, Limitation of conventional machining, Scope of the Electro chemical Machining process and limitations, Scope and limitation of ultra sonic machining process.

TEXT BOOKS

1. Machine Tool Engineering – G.R. Nagpal – Khanna Publishers, New Delhi
2. Fundamentals of Metal Cutting & Machine Tool – B.L. Juneja, G.S. Sekhan, Nitin Sethi – New Age Publishers – New Delhi

REFERENCE BOOKS

1. Production Engineering – P. C. Sharma – S. Chand & Company – New Delhi
2. Production Technology – R.K. Jain – Khanna Publisher – New Delhi
3. Principle of Metal Cutting - G.C. Sen, A. Bhattacharya – New Central Book Agency (P) Ltd., Calcutta
4. Machine Tool Practices – Kibbe Richard R – PHI, New Delhi
5. Principles of Machine Tool – G.C. Sen, A. Bhattacharya – New Central Book Agency, Calcutta

FIFTH SEMESTER
SUBJECT- INDUSTRIAL MANAGEMENT
CODE- DP5442

UNIT – I

Principles of management :

Definition of management, Administration organization, Functions anagement, Planning, Organizing, Co-ordination and control, Structure and function of industrial organisations, Leadership- Need for ledership, Factors to be considered for accomplishing effective leadership, Communication -Importance, Processes, Barriers to communication, Making communication, Effective, formal and informal communication, Motivation - Factors determining motivation, Positive and negative motivation, Methods for improving motivation, Incentives, Pay promotion and rewards, Controlling - Just in time, Total quality management, Quality circle, Zero defect concept. Concept of Stress.

UNIT – II

Human Resource Management

Nature and Scope of Human Resource Planning, Training and Development, Recruitment and Selection, Career Growth, Grievances, Motivation and its types, Need for Motivation, Reward and Punishment, Need, wants, satisfaction chain. Maslow hierarchy of needs. Quality of working life, job enrichment and job enlargement.

UNIT – III

Marketing Management

Marketing Environment: Consumer Markets and Buyer Behaviour, Marketing Mix, Advertising and Sales Promotion, Channels of Distribution.

Financial Management

Book keeping, financial statement Analysis, Financial Ratios, Capital Budgeting, Break-Even Analysis.

Material Management :

Objective of a good stock control system - ABC analysis of inventory, Procurement and consumption cycle, Reorder level, Lead time, Economic order quantity, Pruchasing procedure, Stock keeping, Bin card.

UNIT - IV

Management Information System

Role of information in decision making, Definition of MIS, computer based user machine system, integrated system, MIS v/s Data processing, subsystem of an MIS, MIS DSS and expert system. Evolution and effectiveness of Information system.

UNIT – V

Flexibility in Management

Definition, connotation of flexibility, systematic concept of flexibility, foundation of flexible systemmanagement, types of flexibility and its applications in management of modern organizations.

LABOUR, INDUSTRIAL AND TAX LAWS :

Importance and necessity of industrial legislation, Types of labour laws and dispute, Factory Act 1948, Payment of Wages Act 1947, Employee State Insurance Act 1948, Various types of taxes - Production Tax, Local Tax, Trade tax, Excise duty, Income Tax.

TEXT BOOKS

1. Essential of Management: H. Koonz and h. Wehrich
2. Marketing Management - Kotler Philip- Prentice Hall of India
3. MIS conceptual foundation, structure and development, G B Davis & M H Olson.
4. Flexibility in Management, Sushil, Vikas publication, New Delhi

REFERENCE BOOKS

1. Human Resource Management - Luthans Fred - McGraw Hill, Inc.
2. Organizational Behavior Concepts, Controversies Applications - Stephen, P. Robbins- Prentice Hall, Englewood Cliffs, New Jersey
3. Financial Management – M.Y. Khan and P.K. Jain - Tata Mc-Graw Hill
4. Competitive Advantage - Porter Michael - The Free Press
5. Competitive Strategy - Porter Michael - The Free Press, 1985
6. Fundamentals of Business Organizations and Management – Y.K. Bhusan – S. Chand and Sons
7. Industrial Management – K.K. Ahuja - Khanna Publishers

FIFTH SEMESTER
SUBJECT- POWER PLANT ENGINEERING
CODE- DP5443

UNIT – I Steam Power Plant

Energy conversion in Thermal Power Station, Limitation and conversion of heat into work, Direct conversion devices, Types of power station such as central power station, industrial power station, captive power station – advantages, classification of power station on the basis of prime-movers. Elements of power plant function of each element-generating unit, Prime mover, an auxiliary equipment, and turbo generator. Revision & improvement of thermal efficiency of Rankine cycle by lowering exhaust pressure, increasing boiler pressure and superheating of steam Simple problems on Rankine efficiency. Reheat cycle-representation on T-S and H-S Planes, flow diagram and advantages. Simple regenerating cycle – flow diagram, representation on T-S and H-S plants, bleeding and feed power heating and pumping: advantages of regenerative cycle.

UNIT – II: Steam Generators:

Classification according to working pressure. Accessories – superheater, economizer, preheater and draft equipment. Superheat control methods, Pulverised fuel – necessity, storing systems. High pressure boilers in modern steam power plants such as Velox, Benson, La-mont, leoffler.

Steam Prime mover Steam nozzle-types, Velocity of steam at outlet, Weight of discharge, Area of cross section at throat and outlet, Critical pressure ratio, Nozzle efficiency, Concept of prime mover, Steam turbine – working principle , method of compounding and governing, losses in steam turbines, Lubrication system of steam turbines.

UNIT – III: Condensing Unit

Functions of Steam condenser and its types– jet and surface, Limitations and advantages of steam condenser, Elements of condensing unit, Cooling towers. **Steam Power Station Control and Safety**

Effect of load variation on soft speed, steam admission, valve opening, steam flow rate, steam pressure and combustion control system. Necessity of controlling factors in load variation, Control system (area system, centralised control system) Basic elements of control system, controls and instruments located in modern control station. Control room, Records and their purpose, log sheets or log books.

UNIT – IV: Nuclear Power Station

Nuclear reactions – fission, fusion, mass defect, binding energy, chain reaction, Types of nuclear materials – fissile materials, fertile materials, process of conversion of fertile materials, breeding, moderation. Nuclear reactor – function, elements of nuclear reactor, reactor core, moderator, thermal shielding, reflector, reactor vessel, fuel, coolant flow, control rods, biological shielding, coolant (gaseous, non-boiling liquid, boiling liquid). Hazards in nuclear power station – units of radiations, safe and dangerous doses of radiations, safety precautions in nuclear power station Effects of nuclear materials, nuclear radiation and nuclear waste disposal. **Diesel Engine Power Plants-** Diesel power plant layout ,Functions & components of diesel power plant , Diesel power plant systems such as -Cooling and lubrication system, fuel injection system – basic requirements, solid injection system – common rail system, individual pump system, distribution system, data recording, performance.

UNIT – V : Gas Turbine Power Plants

Advantages of gas turbines , Brayton or Joule Cycle, Open and close cycle, representation of cycle on P.V. and T.S. diagram. Thermal efficiency in terms of terminal temperature and pressure, effect of pressure ratio on thermal efficiency, Advantages and disadvantages of open and close cycle gas turbines, Important components of gas turbine power plant,Methods of improving thermal efficiency,

Hydro Electric Plants - Types of Hydro Electric Plants Comparison of low, medium and high head plants, Elements of hydro power plants, Governing of turbine, Performance of water turbines, Site selection.

TEXT BOOKS

1. A Text Book of Power Plant Engineering – R.K. Rajput – Laxmi Publications

2. A Course in Power Plant Engineering – Arora, Domkundwar – Dhanpat Rai & Co.,2005

REFERENCE BOOKS

1. Power Plant Engineering, 2nd Edn. – P.K. Nag – Tata McGraw-Hill Pub. Com.,
New Delhi, 2004
2. Power Plant Engineering – P.C. Sharma – S.K. Kataria & Sons, 2003

FIFTH SEMESTER
SUBJECT- MECHATRONICS
CODE- DP5444

UNIT I

MECHATRONICS, SENSORS AND TRANSDUCERS

Introduction to Mechatronics Systems – Measurement Systems – Control Systems
Microprocessor based Controllers. Sensors and Transducers – Performance Terminology –
Sensors for Displacement, Position and Proximity; Velocity, Motion, Force, Fluid Pressure, Liquid Flow, Liquid Level, Temperature, Light Sensors – Selection of Sensors

UNIT II

ACTUATION SYSTEMS

Pneumatic and Hydraulic Systems – Directional Control Valves –
Rotary Actuators. Mechanical Actuation Systems – Cams – Gear Trains – Ratchet and pawl –
Belt and Chain Drives – Bearings. Electrical Actuation Systems – Mechanical Switches –
Solid State Switches – Solenoids – Construction and working principle of DC and AC Motors
– speed control of AC and DC drives, Stepper Motors-switching circuitries for stepper motor –
AC & DC Servo motors

UNIT III

SYSTEM MODELS AND CONTROLLERS

Building blocks of Mechanical, Electrical, Fluid and Thermal Systems, Rotational –
Transnational Systems, Electromechanical Systems – Hydraulic –
Mechanical Systems. Continuous and discrete process Controllers – Control Mode – Two –
Step mode – Proportional Mode – Derivative Mode – Integral Mode – PID Controllers –
Digital Controllers – Velocity Control – Adaptive Control – Digital Logic Control –
MicroProcessors Control.

UNIT IV

PROGRAMMING LOGIC CONTROLLERS

Programmable Logic Controllers – Basic Structure – Input / Output Processing – Programming –
Mnemonics – Timers, Internal relays and counters – Shift Registers –
Master and Jump Controls – Data Handling – Analogs Input / Output – Selection of a PLC.

UNIT V

DESIGN OF MECHATRONICS SYSTEM

Stages in designing Mechatronics Systems – Traditional and Mechatronic Design -
Possible Design Solutions. Case studies of Mechatronics systems- Pick and place Robot-
Autonomous mobile robot-Wireless surveillance balloon- Engine Management system-
Automatic car park barrier.

TEXT BOOKS:

1. Bolton, W, “Mechatronics” , Pearson education, second edition, fifth Indian Reprint, 2003

2. Smaili.A and Mrad.F , "Mechatronics integrated technologies for intelligent machines", Oxforduniversity press, 2008

REFERENCES:

1. Rajput. R.K, A textbook of mechatronics, S. Chand & Co, 2007
2. Michael B. Hirst and David G. Alciatore, " Introduction to Mechatronics and Measurement Systems", McGraw-Hill International Editions, 2000.
3. Bradley D. A., Dawson D., Buru N.C. and. Loader A.J, "Mechatronics", Chapman and Hall, 1993.
4. Dan Neculescu, "Mechatronics", Pearson Education Asia, 2002 (Indian Reprint).
5. Lawrence J. Kamm, "Understanding Electro – Mechanical Engineering", An Introduction to Mechatronics, Prentice – Hall of India Pvt., Ltd., 2000.
6. Nitaigour Premchand Mahadik, "Mechatronics", Tata McGraw-Hill publishing Company Ltd, 2003

FIFTH SEMESTER
SUBJECT- ESTIMATION AND COSTING
CODE- DP5445

Unit-I

Utility, value, wealth, consumption, wants, necessities, comforts and luxuries. laws of demand, elasticity of demand.

Unit-II

Production, agents of production, laws of returns. Forms of business organization. Single trader, partnership and public limited company.

Unit-III

Price determination in perfect competition, monopoly and imperfect competition. Rent, interest, money, cheques, bills of exchange.

Unit-IV

Costing- Cost concepts, Elements of cost, Methods of distribution of overhead costs. Unit costing, Job costing and process costing.

Unit- V

Break- Even analysis, Depreciation methods, Preparation of profit and loss account and balance sheet (Outlines only).

Text Book:

1. Engineering Economics, Vol.1, Tara Chand.

References:

1. A Text book of Economic Theory by Dhingra and Garg.
2. Cost Accounts by Shukla and Grewal.

**FIFTH SEMESTER
SUBJECT- MACHINE DESIGN LAB
CODE- DP545**

EXPERIMENTS TO BE PERFORMED:

Each student shall submit two-assembly design report along with the drawing for assembly/sub assembly for any mechanical system consisting of not less than four machine elements included in the syllabus.

FIFTH SEMESTER
SUBJECT- AUTOMOBILE ENGINEERING LAB
CODE- DP546

LIST OF PRACTICALS / TUTORIALS:

- Dismantling & assembly of 4 stroke petrol engine (Jeep/Car)
- Dismantling & assembly of 4 stroke diesel engine.(Jeep/Car).
- Dismantling and assembly of 2 stroke engine like Scooter/Moped/Motorcycle engine.
- Disassembly and assembly of following carburettors with their correct tuning.
(1) Solax Carburettor (2) Scooter Carburettor, (3) 4 stroke motor cycle carburettor.
- Disassembly and assembly of plunger type of fuel pump, rotary fuel pump & fuel injector with their correct tuning.
- Study of Air & water-cooling systems of a motorcycle and car engine.
- Dismantling & assembly of battery ignition system.
- Study of Alternator, dynamo and Startor Bendix drive by dismantling & assembly.
- Study of Gear box by dismantling & assembling of Sliding mesh, constant mesh & Synchromesh gear boxes.
- Dismantling & assembling of single plate clutch, Diaphragm clutch, Centrifugal Clutch.
- Dismantling assembly of steering gear of rack and pinion type of Maruti Car.
- Study hydraulic braking system of Car / truck.
- Study Air Braking system of truck.
- Study of front axle and steering system of a car
- Study independent & conventional Suspension system (Maruti/Jeep/Indica)
- To balance wheels on Dynamic wheel balancing machine.
- Conduct trial on petrol & diesel gas Analyzer & analyze results.
- Tune up petrol & diesel engine for minimum Emission level.

FIFTH SEMESTER
SUBJECT- ADVANCE MANUFACTURING LAB
CODE- DP547

List of Experiments :

- 1) Inspection procedures, codes and standard
- 2) Magnetic Particle Testing
- 3) Die Penetrant Testing
- 4) Liquid Penetration Report
- 5) Eddy Current Testing
- 6) Ultrasonic Inspection
- 7) Radiography
- 8) Study of IS standards in molding material, sand testing
- 9) Study of IS Standard in welding (weld material, weld testing, welding symbol)
- 10) Design of gating and feeding system for simple casting
- 11) Industrial Visit of industries to study the various manufacturing processes.

FIFTH SEMESTER
SUBJECT- CAD CAM LAB
CODE- DP548

EXPERIMENTS TO BE PERFORMED

CAD (MINIMUM FIVE EXPERIMENTS)

1. Introduction & different features of the CAD Software
2. 2-D Drafting
3. 3-D Modeling
4. 3-D Advanced Modeling
5. Assembly modeling
6. Feature Modification and Manipulation
7. Detailing
8. Sheet Metal Operations
9. Surface Modeling
10. One Dimensional problems of Finite Element Method.

(These exercises may be performed by any of the following Advanced CAD Software)

CAM (MINIMUM FIVE EXPERIMENTS)

1. To prepare part programming for plain turning operation.
2. To prepare part programming for turning operation in absolute mode.
3. To prepare part program in inch mode for plain turning operation.
4. To prepare part program for taper turning operation.
5. To prepare part program for turning operations using turning cycle.
6. To prepare part program for threading operation.
7. To prepare part program for slot milling operation.
8. To prepare part program for gear cutting operation.
9. To prepare part program for gear cutting using mill cycle.
10. To prepare part program for drilling operation.
11. To prepare part program for multiple drilling operation in Z-axis.
12. To prepare part program for multiple drilling in X-axis.
13. To prepare part program for multiple drilling in X and Z axis using drilling cycle.

LIST OF EQUIPMENTS/MACHINES REQUIRED

1. Computer Numerically Control Lathe Trainer
2. P-IV (IBM) 2.6 GHz, 80 GB HDD, 256/512 SD RAM (As Compatible with CAD Software) 52 X CD RW, 1.44 MB
FDD, 17" Colour Monitor, Laser Scroll Mouse
3. Software – Pro-E, Solid-work, CATIA, ANSYS
4. CNC Controlled Milling Machine
5. CNC Controlled Drilling Machine

FIFTH SEMESTER
SUBJECT- VOCATIONAL TRAINING & EVALUATION
CODE- DP549

All student should submit the report file of their vocational training and give power point presentation regarding the same.