SCHEME OF EXAMINATION

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SYLLABI

for

B. TECH.INDUSTRIAL AND PRODUCTION ENGINEERING
YEAR FOURTH
(Effective from the session: 2009-2010)

Uttrakhand Technical University,Dehradun

www.uktech.in

UTTRAKHAND TECHNICAL UNIVERSITY, DEHRADUN
STUDY AND EVALUATION SCHEME
B. TECH.INDUSTRIAL AND PRODUCTION ENGINEERING
YEAR FOURTH, SEMESTER - VII
(Effective from the session: 2009-2010)

S.No	Course Code	Subject	PERIODS			EVALUATION SCHEME				Subject Total
						SESSIONAL EXAM			EXAM ESE	
			L	T	P	CT	TA	Total		
1	TIP-701	CAD/CAM	3	1	0	30	20	50	100	150
2	TIP-702	AUTOMOBILE ENGINEERING	3	1	0	30	20	50	100	150
3	TIP-703	MECHANICAL SYSTEM DESIGN	3	1	0	30	20	50	100	150
4	EIP-701	Elective-I	3	1	0	30	20	50	100	150
5		Open Elective	3	1	0	30	20	50	100	150
Practical/Training/Project										
1	PIP-701	CAD/CAM LAB	0	0	2	-	25	25	25	50
2	PIP -751	INDUSTRIAL TRAINING VIVA	0	0	2	-	25	25	25	50
3	PIP-752	PROJECT	0	0	2	-	50	50	-	50
4	GP-751	GENERAL PROFICIENCY	0	0	2	-	50	50		50
5	PIP-753	SEMINAR	-	-	-	-	50	50	-	50
Total			**15**	**5**	**8**					**1000**

Choose one Subject from each Elective

Code	Elective I
EIP-701	ADVANCE PRODUCTION ENGINEERING
EIP-702	INDUSTRIAL AUTOMATION AND ROBOTICS
EIP-703	ENGINEERING ECONOMICS AND INDUSTRIAL DESIGN

UTTRAKHAND TECHNICAL UNIVERSITY, DEHRADUN
STUDY AND EVALUATION SCHEME
B. TECH.INDUSTRIAL PRODUCTION ENGINEERING
YEAR FOURTH, SEMESTER - VIII
(Effective from the session : 2009-2010)

S.No	Course Code	Subject	PERIODS			EVALUATION SCHEME				Subject Total
						SESSIONAL EXAM			EXAM ESE	
			L	T	P	CT	TA	Total		
1	TIP-801	UNCONVENTIONAL MANUFACTURING PROCESSES	3	1	0	30	20	50	100	150
2	TIP-802	NON CONVENTIONAL ENERGY RESOURCES AND UTILIZATION	3	1	0	30	20	50	100	150
3	EIP-801	ELECTIVE 2	3	1	0	30	20	50	100	150
4	EIP-806	ELECTIVE 3	3	1	0	30	20	50	100	150
Practical/Training/Project										
1	PIP-852	INDUSTRIAL TRAINING PRESENTATION	0	0	2	-	25	25	25	50
2	PIP-851	Project	0	0	2	-	100	100	200	300
3	GP-852	GENERAL PROFICIENCY	-	-	-	-	50	50	-	50
Total			**12**	**4**	**4**					**1000**

Choose one subject from each elective

Code	Elective II	Code	Elective III
EIP-801	FACILITIES PLANNING AND VALUE ENGINEERING	EIP-804	PLANNING AND CONTROL OF MANUFACTURING SYSTEMS
EIP-802	METALLURGY AND HEAT TREATMENT	EIP-805	PRODUCT DEVELOPMENT AND DESIGN
EIP-803	MAINTENANCE AND RELIABILITY ENGINEERING	EIP-806	PRODUCTIVITY ENGINEERING AND TECHNOLOGY MANAGEMENT

TIP-701: CAD/CAM **[2 0 4 4]**

UNIT I:

The design process Morphology of design: Product cycle, Sequential and concurrent engineering, Role of computers, Computer Aided Engineering, Computer Aided Design, Design for Manufacturability, Computer Aided Manufacturing, Benefits of CAD.

Creation of Graphic Primitives: Graphical input techniques, Display transformation in 2-D and 3-D Viewing transformation, Clipping, hidden line elimination, Mathematical formulation for graphics, Curve generation techniques, Model storages and Data structure, Data structure organization, creation of data files, Accessing data files, Concepts of data processing and information system. Data Bank Concepts, Data bank information storage and retrieval, Data life cycle, integrated data processing, Information system, Engineering Data Management System. Hierarchical data structure. Network data structure - Relational data structure. Data storage and search methods.

UNIT II:

Geometric Modeling: Wire frame, Surface and Solid models, CSG and B-REP techniques, Features of Soild Modeling Packages, Parametric and features, Interfaces to drafting, Design Analysis.

Finite Element Analysis: Introduction, Procedures, Element types, Nodal approximation, Element matrices, vectors and equations, Global connectivity, Assembly, Boundary conditions, Solution techniques, Interfaces to CAD, Introduction packages, Software development for design of mechanical components.

UNIT III:

Computer Aided Manufacturing: Evolution of Computer Numerical Control, Components, Co-ordinate system, Working principle of CNC Lathe, Turning Centers, Milling Machine, Machining Center, Drilling Machine, Boring Machine, Punching and Nibbling Machines, Pipe-Bending Machine, Spot Welding Machine, Electro Discharge Machine, Grinding Machine, Laser and electron Beam Machining Equipment, DNC and adaptive control Machine structure, Slideways, Ballscrews, Accessories-Spindle drives-Axes feed drives, Open and closed loop control, Types of positional control, Machine Tool control, Control of Spindle speed, Control of slide movement and velocity.

UNIT IV:

Part Program Terminology: G and M Codes, Types of interpolation, Methods of CNC part programming, Manual part programming, Computer Assisted part programming: APT language , CNC part programming using CAD/CAM-Introduction to Computer Automated Part Programming.

UNIT V:

Cutting tool materials: Hard metal insert tooling, Choosing Hard Metal tooling-ISO specification, Chip breakers-Non insert tooling, Qualified and pre-set tooling, Tooling System- Turning center-Machining center.

Factors influencing selection of CNC Machines: Cost of operation of CNC Machines-cost of Operation of CNC Machines-Practical aspects of introduction of CNC-Maintenance features of CNC Machines-Preventive Maintenance.

TIP-702: AUTOMOBILE ENGINEERING

Unit-I

Power Unit and Gear Box:

Principles of Design of main components. Valve mechanism. Power and Torque characteristics. Rolling, air and gradient resistance. Tractive effort. Gear Box. Gear ratio determination. Design of Gear box.

Unit-II

Transmission System:

Requirements. Clutches. Toque converters. Over Drive and free wheel, Universal joint. Differential Gear Mechanism of Rear Axle. Automatic transmission, Steering and Front Axle. Castor Angle, wheel camber & Toe-in, Toe-out etc.. Steering Geometry. Ackerman mechanism, Understeer and Oversteer.

Unit-III

Braking System:

General requirements, Road, tyre adhesion, Weight transfer, Braking ratio. Mechanical brakes, Hydraulic brakes. Vacuum and air brakes. Thermal aspects.

Chasis and Suspension System:

Loads on the frame. Strength and stiffness. Various suspension systems.

Unit-IV

Electrical System :

Types of starting motors, generator & regulators, lighting system, Ignition system, Horn, Battery etc.

Fuel Supply System:

Diesel & Petrol vehicle system such as Fuel Injection Pump, Injector & Fuel Pump, Carburetor etc. MPFI.

Unit-V

Automobile Air Conditioning:

Requirements, Cooling & heating systems.

Cooling & Lubrication System:

Different type of cooling system and lubrication system.

Maintenance system:
Preventive maintenance, break down maintenance and Over hauling.

TIP-703 : MECHANICAL SYSTEM DESIGN

UNIT-I

Engineering process and System Approach

Basic concepts of systems, Attributes characterizing a system, system types, Application of system concepts in Engineering, Advantages of system approach, Problems concerning systems, Concurrent engineering, A case study-Viscous lubrication system in wire drawing.

Problem Formulation

Nature of engineering problems, Need statement, hierarchical nature of systems, hierarchical nature of problem environment, problem scope and constraint, A case study: heating duct insulation system, high speed belt drive system.

UNIT-II

System Theories

System Analysis, Black box approach, state theory approach, component integration approach, Decision process approach, A case study- automobile instrumentation panel system.

System modeling

Need of modeling, Model types and purpose, linear systems, mathematical modeling, concepts, A case study compound bar system.

UNIT-III

Graph Modeling and Analysis

Graph Modeling and analysis process, path problem, Network flow problem, A case study: Material handling system.

Optimization Concepts

Optimization processes, Selection of goals and objectives-criteria, methods of optimization, analytical, combinational, subjective. A case study: aluminium extrusion system.

UNIT-IV

System Evaluation

Feasibility assessment, planning horizon, time value of money, Financial analysis, A case study: Manufacture of maize starch system.

Calculus Method for Optimization

Model with one decision variable, model with two decision variables, model with equality constraints, model with inequality constraints, A case study: Optimization of an insulation system.

UNIT-V

Decision Analysis

Elements of a decision problem, decision making, under certainty, uncertainty risk and conflict probability, density function, Expected monetary value, Utility value, Baye's theorem, A case study: Installation of machinery.

System Simulation

Simulation concepts, simulation models, computer application in simulation, spread sheet simulation, Simulation process, problem definition, input model construction and solution, limitation of simulation approach, A case study: Inventory control in production plant.

ELECTIVE-1

TIP-701: Advance production engineering

Unit-I

Metal Forming Processes :

Elastic & plastic deformation, yield criteria. Hot working vs cold working. Analysis (equilibrium equation method) of Forging process for load estimation with sliding friction, sticking friction and mixed condition for slab and disc. Work required for forging, Hand, Power, Drop Forging.

Unit-II

Metal Forming Processes (continued):

Analysis of Wire/strip drawing and maximum-reduction, Tube drawing, Extrusion and its application.

Condition for Rolling force and power in rolling. Rolling mills & rolled-sections. Design, lubrication and defects in metal forming processes

Unit-III

Metal Cutting and Machine Tools

Metal Cutting-

Mechanics of metal cutting. Geometry of tool and nomenclature, ASA system Orthogonal vs. oblique cutting. Mechanics of chip formation, types of chips. Shear angle relationship. Merchant's force circle diagram. Cutting forces, power required. Cutting fluids/lubricants, Tool materials, Tool wear and tool life. Machinability. Dynamometer.Brief introduction to machine tool vibration and surface finish. Economics of metal cutting.

Unit-IV

Unconventional Metal forming :

Unconventional metal forming processes such as explosive forming, electromagnetic, electro-hydraulic forming.

Unit- V

Unconventional Machining :

Principle and working and applications of unconventional machining process such as Electro-Discharge machining, Electrochemical machining, ultrasonic machining, Abrasive jet machining,laser beam machining,Electron beam machining.

EIP-702: Industrial Automation and Robotics

UNIT I:

Hydraulics: Hydraulic System Elements: Pumps, types, working, characteristics, applications: Types of conductors, and connectors, their selection,: Seals and packing , types, materials, applications. Hydraulic Actuators: Linear and Rotary, types, working, cushioning effect, mounting, calculation of force and velocity of piston System components: Accumulators, Intensifiers, their types, working, applications.

UNIT II:

Hydraulics(continued): Control Elements: Pressure control Valves, direct acting type, pilot operated, sequence, counterbalancing, unloading, pressure reducing, construction and working: Direction control valves, types, construction and working, spool actuation methods, spool center positions, Flow control valves – compensated and non compensated types, construction and working. Hydraulic Circuits and their Applications: Speed control circuits, regenerative, sequencing, counterbalancing, synchronizing, interlocking, circuits with accumulator and intensifier. Introduction to Fluidics and study of simple logic gates: Hydraulic clamping and braking systems.

UNIT III:

Pneumatics: Air compressors, types, working, selection criteria; FRL unit , construction and working; Pneumatic cylinders and air motors, construction and working, types, calculation of force and air consumption, Comparison of air, hydraulic and electric motor. Pneumatic System Control Elements: Direction control valves, types, control methods for spool working; Flow control valves, working of variable flow control, quick exhaust, time delay and shuttle valve; Pressure control valves, types and working. Pneumatic Circuits: Basic circuit, impulse operation, speed control, sequencing, time delay circuits and their applications. Pneumatic clamping and braking systems, Pneumatic power tools. Hydro pneumatic systems: concept, working and applications. Fluid power maintenance, troubleshooting and safety.

UNIT IV:

Robotics: Definition-types & classification of Robot-need for Robot-Installation procedure-area of applications-basics parts & function-specification. Mechanical, Electrical & fluid power-combination-selection of system-simple problems based on load for linear & rotary travel-control system-servo control-interfacing methods-micro processor, PLC and PC based. Functions of sensors-types and selection of sensors-need for grippers-types and selection of

grippers-common types of grippers used-end effectors. Types of programming-programming languages-sample program for different types of robots-vision system application of image processing.

UNIT V:

Automation devices: Feeders, orienters, catchment devices, PLC architecture and programming

EIP-703: Engineering Economics and Industrial Design

UNIT I:

Introduction: Definitions, what is industrial design, assessing the need for ID, product and process cycles, ethics, societal and economic considerations in engineering, technological forecasting, technological innovation and design process.

Design Process: Importance of product design, considerations of a good design, detailed descriptions of design process, role of marketing, organization for design and role of computers in design.

UNIT II:

Concept generation & concept selection: Concept generation process, basic methods, information gathering and brain storming, conventional aids, brain ball, C-Sketch/6-3-5 method: advanced methods: Direct search, systematic search with physical principles and classifying schemes: Morphological analysis, factors that determine effective decision making, Estimating technical feasibility, concept selection process- basic and advanced methods.

UNIT III:

Product Modeling: model preparation & selection method, construction of product models, physical models/ prototypes, types of prototypes, uses of prototypes, rapid prototyping techniques, dimensional analysis, similitude and scale models, geometrical modeling on the computer, computer visualization.

Design for Robustness: Quality design theory, general robust design model, robust design model construction, taguchi's method; noise variable matrix, design variable matrix, experimental matrix, signal to noise ratio, selection of target design, optimization methods, finite element analysis, evaluation considerations in optimization, design optimization.

UNIT IV:

Design for manufacturing and assembly: Estimation of manufacturing costs, reducing the cost of components and assemblies, design for assembly, design for piece part production, cost driver modeling and manufacturing cost analysis.

Simulation: concept of simulation, advantages and disadvantages of simulation, areas of application, systems and system environment, components of a system, discrete and

continuous systems, model of a system, types of models, steps in a simulation study, simulation application examples

UNIT V:

Economic decision-making: Break-Even analysis, Applications of Break-Even Analysis, Investment Decisions, Payback Period, ARR, NPV and IRR methods, Depreciation, benefits - cost analysis.

Cost evaluation: categories of cost, method of developing cost estimates, cost indexes, cost capacity factors, estimation of plant cost, design cost, manufacturing costs, value analysis in costing, overhead costs, activity based costing, learning curve, cost models, life cycle costing.

PIP-701: CAD/CAM LAB

A. CAD Experiments

1. Line Drawing or Circle Drawing experiment: Writing and designing steps.
2. Design of machine component or other system experiment: Writing and designing steps.
3. Understanding and use of any 3-D Modeling Software commands.
4. Pro/E/Idea etc. Experiment: Solid modeling of a machine component.
5.Understanding the commands and specific usages in CAD.

B. CAM Experiments

1. To study the characteristic features of CNC machine.
2. Experiment on Robot and programs.
3. Experiment on Transfer line/Material handling.
4. Experiment on difference between ordinary and NC machine, study on Mechatronics and controls.
5. Experiment on study of system devices such as motors and feed back devices.

TIP-802: UNCONVENTIONAL MANUFACTURING ROCESSES

Unit-I

Introduction: Limitations of conventional manufacturing processes, need of unconventional manufacturing processes & its classification and its future possibilities.

Unit-II

Unconventional Machining Process: Principle and working and applications of unconventional machining process such as Electro-Discharge machining, Electrochemical machining, ultrasonic machining, Abrasive jet machining etc.

Unit-III

Unconventional Machining Process (continued) : Principle and working and application of unconventional machining processes such as Laser beam Machining, Electron beam machining, Ultrasonic machining etc.

Unit-IV

Unconventional welding processes: Explosive welding, Cladding etc. Under water welding, Metalizing, Plasma are welding/cutting etc.

Unit-V

Unconventional Forming processes: Principle, working and applications of High energy forming processes such as Explosive Forming, Electromagnetic forming, Electro-Discharge forming, water hammer forming, explosive compaction etc.

Electronic-device Manufacturing: Brief description of Diffusion and Photo- Lithography process for electronic-device manufacturing.

TIP-803: NON-CONVENTIONAL ENERGY RESOURCES AND UTILISATION

UNIT-1

Energy resources and their utilization :

Indian and global energy sources, Energy exploited, Energy planning, Energy parameters (energy intensity, energy-GDP elasticity), Introduction to various sources of energy, Solar thermal, Photovoltaic, Water power, Wind energy, Biomass, Ocean thermal, Tidal and wave energy, Geothermal energy, Hydrogen energy systems, Fuel cells, Decentralized and dispersed generation.

Solar radiations:

Extra terrestrial radiation, Spectral distribution, Solar constant, Solar radiations on earth, Measurement of solar radiations, Solar radiation geometry, Flux on a plane surface, Latitude, Declination angle, Surface azimuth angle, Hour angle, Zenith angle, Solar altitude angle expression for angle between incident beam and the normal to a plane surface (no derivation), Local apparent time, Apparent motion of sun, Day length, Solar radiation data for India.

UNIT-2

Solar energy:

Solar thermal power and it's conversion, Solar collectors, Flat plate, Performance analysis of flat plate collector, Solar concentrating collectors, Types of concentrating collectors, Thermodynamic limits to concentration, Cylindrical collectors, Thermal analysis of solar collectors, Tracking CPC and solar swing.

Solar thermal energy storage, Different systems, Solar pond, Applications, Water heating, Space heating & cooling, Solar distillation, solar pumping, solar cooking, Greenhouses, Solar power plants.

Solar photovoltaic system:

Photovoltaic effect, Efficiency of solar cells, Semiconductor materials for solar cells, Solar photovoltaic system, Standards of solar photovoltaic system, Applications of PV system, PV hybrid system.

UNIT-3

Biogas:

Photosynthesis, Bio gas production Aerobic and anaerobic bio-conversion process, Raw materials, Properties of bio gas, Producer gas, Transportation of bio gas, bio gas plant technology & status, Community biogas plants, Problems involved in bio gas production, Bio gas applications, Biomass conversion techniques, Biomass gasification, Energy recovery from urban waste, Power generation from liquid waste, Biomass cogeneration,Energy plantation, Fuel properties, Biomass resource development in India.

Wind energy:

Properties of wind, Availability of wind energy in India, wind velocity, Wind machine fundamentals, Types of wind machines and their characteristics, Horizontal and Vertical axis wind mills, Elementary design principles, Coefficient of performance of a wind mill rotor, Aerodynamic considerations in wind mill design, Selection of a wind mill, Wind energy farms, Economic issues, Recent development.

UNIT-4

Electrochemical effects and fuel cells:

Principle of operation of an acidic fuel cell, Reusable cells, Ideal fuel cells, Other types of fuel cells, Comparison between acidic and alkaline hydrogen-oxygen fuel cells,Efficiency and EMF of fuel cells, Operating characteristics of fuel cells, Advantages of fuel cell power plants, Future potential of fuel cells .

Tidal power:

Tides and waves as sources of energy, Fundamentals of tidal power, Use of tidal energy Limitations of tidal energy conversion systems.

Hydrogen Energy: Properties of hydrogen in respect of it's use as source of renewable energy, Sources of hydrogen, Production of hydrogen, Storage and transportation, Problems with hydrogen as fuel, Development of hydrogen cartridge, Economics of hydrogen fuel and its use..

UNIT-5

Thermoelectric systems:

Kelvin relations, power generation, Properties of thermoelectric materials, Fusion Plasma generators.

Geothermal energy:

Structure of earth's interior, Geothermal sites, earthquakes & volcanoes, Geothermal resources, Hot springs, Steam ejection, Principal of working, Types of geothermal station with schematic representation, Site selection for geothermal power plants. Advanced concepts, Problems associated with geothermal conversion.

Ocean energy;
Principle of ocean thermal energy conversion, Wave energy conversion machines, Power plants based on ocean energy, Problems associated with ocean thermal energy conversion systems, Thermoelectric OTEC, Developments of OTEC, Economics.Impact of renewable energy generation on environment, Kyoto Protocol, Cost of electricity production from different energy sources, Energy options for Indian economy.

ELECTIVE-2

EIP-801: Facilities Planning & Value Engineering

UNIT I:
Introduction to facilities planning and design: plant layout, material handling and their interrelationship, objectives of a good plant layout, principles of a good layout, classical types of layouts, special types and practical layouts.
Factors affecting plant layout: man, material, machine, movement, waiting, service, building and change, features and considerations of each factor, procedure of plant layout, data collection for layout design, layout visualization using templates and 3D models.

UNIT II:
Site location: various theories/models of site location like equal weights, variable weights, weight cum rating, composite model and Bridgemannn's model, Weber index, and various subjective techniques, evaluation of layout, computerized layout, flowcharts of various programmes like CRAFT, ALDEP AND CORELAP.

UNIT III:
Material handling: principles, factors affecting material handling, objectives, material handling equation, selection of material handling systems and equipments, cranes, conveyors, hoists and industrial trucks, installation of new facilities in the existing setup using median model and gravity model.

UNIT IV:
Introduction to value engineering & value analysis: methodology of value engineering, unnecessary costs, use and prestige value, estimation of product quality or performance. Types of functions functional cost and functional worth. Effect of value improvement on profitability, tests for poor value.

UNIT V:
Aims and objectives of value engineering, systematic approach. Value engineering, job plan-study of various phases of the job plan. Selection of projects for value analysis. Primary and secondary functions work and sell functions, determining and evaluating functions, assigning equivalence, function-cost matrix evaluation. Function (FAST).Reporting, implementation & follow up.

EIP-802: Metallurgy and Heat Treatment

[3 0 0 3]

UNIT I:

Creep: Introduction, time dependent mechanical behavior, creep curve, mechanism of creep, factors affecting creep, effect of alloys, creep under combined stresses, presentation of engineering creep data, fatigue creep interaction.

Equilibrium Diagrams for non-ferrous alloys: Review of cooling curves, phase rule, solid state transformation, phase diagram of non-ferrous alloys

UNIT II:

Iron Carbon Diagram: Allotropic forms of carbon, solid and liquid state reactions, types of steels, types of cast irons, microstructures at various carbon percentages, properties as a function of microstructures, significance of IC diagram. Cooling curves and equilibrium diagrams for brass and aluminum alloys.

TTT Diagrams: Time temperature transformations diagram, transformations as a function of cooling rate, mechanism of various transformations, significance of TTT diagram.

UNIT III:

Heat Treatment Methods: Mechanism of annealing and advantages, mechanism of normalizing and advantages, mechanisms of tempering and advantages, mechanism of hardening and advantages, mechanism of case hardening and advantages, mechanism of induction hardening and advantages.

UNIT IV:

Chemical Heat Treatment Methods: Introduction to chemical heat treatment, mechanism and methods of carburizing, nitriding, cyaniding, introduction to flame hardening.

UNIT V:

Hardenability: Meaning of Harden ability, tests of Harden ability, factors affecting Harden ability

Effect Of Alloying Elements: Effect on strength and hardness, effect on Harden ability, effect on transformation temperature

EIP-803: Maintenance and Reliability Engineering

UNIT I:

Objectives and policies of maintenance, organization and structure of maintenance systems, maintenance records, types of maintenance, breakdown, predictive, replacement, on-line, off-line, preventive maintenance, reconditioning and correction maintenance.

UNIT II:

Preventive maintenances v/s. repair, development of preventive maintenance schedule, top down bottom up approach, production maintenance integration.

Maintenance manpower planning, spare parts management, computerized maintenance system, condition based monitoring, on-line v/s off-line maintenance systems, maintenance devices, budgeting and cost control.

UNIT III:
Concept of reliability, objectives, applications, area of use, use of reliability in industry. Mean time to repair, mean time between failures, mean time to failure, types of failure, permanent failure, proneness to failure, bath tub curve.

UNIT IV:
Reliability functions, probability function, failure rate, failure density, hazard rate, uncertainity measures. Concept of redundancy, objectives, applications, redundant standby systems, Determination of reliability, Series and parallel-connected systems, confidence levels.

UNIT V:
Fault tree diagram, event tree, failure rate, beta, Gamma, Log-normal and Weibull distribution, Design & analysis of life tests.
Introduction to failure mode and effect analysis, FMEA and FMECA, criticality analysis, severity, occurrence and detection of failure, case studies.

ELECTIVE-3

EIP-804: Planning and Control of Manufacturing Systems

[3 1 0 4]

UNIT I:
Production Processes: discrete and process types, mass, batch, unit flexible manufacturing types, manufacturing operations: selection of a process, difference between manufacturing and service operations, classification of manufacturing processes, 5 Ps in the organization.
Process Design: Systems approach to process planning and design, linkage between product planning and process planning, distinction between process planning and facilities planning, types of process design, product mix, process planning aids, process design procedure.

UNIT II;
Forecasting: characteristics of demand over time, forecasting qualitative model: Delphi, naïve quantitative models: simple average, simple moving average, weighted moving average, exponential smoothing, smoothing coefficient selection, adaptive exponential smoothing, incorporating trend and seasonal components, linear regression, selection of forecasting models.
Aggregate Planning: Concept, strategies for aggregate planning: three pure planning strategies, graphical method for aggregate output planning, master production scheduling (MPS), procedure for developing MPS.

UNIT III:

Shopfloor planning and control: Nature, factors determining production planning, factors determining production control, phases in production planning and control, limitations of PPC, measuring effectiveness of PPC, production activity control, operations planning and scheduling, scheduling process-focused production systems, scheduling techniques for job shop, stages in scheduling, load charts and machine loading charts, dynamic sequencing rules, scheduling product –focused systems, scheduling for flexible manufacturing system.

UNIT IV:

Resource Requirements Planning: Nature, resource requirement planning system, MRP-I, MRP-II, MRP Computational procedure, issues in MRP, implementation of MRP, evaluation of MRP, Introduction to ERP.

UNIT V:

Introduction to project planning and control: Nature, project life cycle, project organization, role of project manager, project planning and control, techniques, project scheduling techniques, line of balance.

Manufacturing planning & Control systems: JIT, CIM and WCM

EIP-805: PRODUCT DEVELOPMENT AND DESIGN

Unit-I:

Introduction to Product Design

Introduction to PDD, Applications, Relevance, Product Definition, Scope, Terminology.Design definitions, the role and nature of design, old and new design methods, Design by evolution. Examples such evolution of bicycle, safety razor etc. Need based development, technology based developments. Physical reliability & Economic feasibility of design concepts.

UNIT II:

Morphology of Design

Divergent, transformation and convergent phases of product design. Identification of need, Analysis of need. Design for what? Design criteria, functional aspects. Aesthetics,ergonomics, form (structure). Shape, size, color. Mental blocks, Removal of blocks,Ideation Techniques. Creativity, Checklist.7

UNIT III:

Transformations

Brainstorming & Synectics. Morphological techniques. Utility concept, Utility value, Utility index. Decision making under multiple criteria. Economic aspects of design. Fixed and variable costs. Break-even analysis.

UNIT IV:

Reliability

Reliability considerations, Bath tub curve, Reliability of systems in series and parallel. Failure rate, MTTF and MTBF. Optimum spares from reliability consideration. Design of displays and controls, Man-Machine interface, Compatibility of displays and controls. Ergonomic aspects. Anthropometric data and its importance in design. Applications of Computers in product design.

UNIT V:

Product Appraisal

Information and literature search, patents, standards and codes. Environment and safety considerations. Existing techniques such as work-study, SQC etc. which could be used to improve method & quality of product. Innovation versus Invention. Technological Forecasting.

EIP-806: Productivity Engineering And Technology Management

UNIT I:

Productivity concept and definition, productivity and economic development, impact of productivity in macro-economic context, productivity and production, productivity and profitability, productivity and quality, productivity and technology, external environment and productivity, total, partial and total factor productivity**.**

UNIT II:

Measurement of productivity: factors affecting the productivity of any nation, GDP and GNP, productivity at firm level, measurement approaches, total productivity model, product oriented model, computer algorithms for measuring total and partial productivity. Productivity measurement of services.

UNIT III:

Productivity evaluation: Productivity evaluation and planning, methodologies for evaluation, the productivity evaluation tree, short-term and long-term productivity planning.

UNIT IV:

Technology management: Need for managing the technology, importance of technology and its management, role of technology in economic development, technological change in modern society.

Technology planning, technology forecasting, applications of technology forecasting and it's impact on business, technology life cycle and it's importance.

UNIT V:

Technology transfer: Technology transfer at macro and micro level, need for technology transfer, modes of technology transfer, technology adaptation, factors affecting technology

adaptation, technology absorption, technology diffusion, technology transfer agreements, negotiations in technology transfer, cultural differences, introduction to re-engineering, characteristics of technology in developing countries, role of R & D department in technology adaptation & development, implementation of acquired technology.