BTAE/DE 610 Servo Mechanism and Automatic Control Systems

L T P **Internal Marks: 40**
3 0 0 **External Marks: 60**

UNIT I INTRODUCTION: Basic elements of control system; Open and closed loop control system; Manually and automatically controlled closed loop system; Basic elements of a servo mechanism; Example of automatic control systems; Use of equivalent systems for system analysis; Linear systems, non-linear systems control systems: Examples from mechanical systems, electrical systems and automobile systems. Types of control systems, Performance analysis; Regulators and servo mechanism; Analog and digital control system. 9

UNIT II CONTROL SYSTEM: Introduction; Transfer function; Addition of poles and zeros; Root locus techniques; Polar plots; Rectangular plots. 4

UNIT III CONTROL ELEMENTS: Block diagram, reduction of block diagram, problems on block diagram; Representation of system and process; Liquid, gas, mechanical and thermal system; Hydraulic servo motor; Control valve; Comparison elements, Stability and Hurwitz - Routh criteria. 9

UNIT IV APPLICATION OF CONTROL SYSTEM: Machine tool control; Boiler control; Engine governing-mechanical, hydraulic, electric, pneumatic; Carburetor; Diesel fuel control; Gyroscopes; Active and vibration control. 8

UNIT V SEQUENTIAL CONTROL: Introduction; input and output devices, diagrams; Fluid devices; Ladder devices; Hydraulic and pneumatic actuation system. 6

RECOMMENDED BOOKS:

1. Nagrath and Gopal, “Control Systems Engineering”, New Age Internationals
2. B.C. Kuo, “Automatic Control systems”, Wiley India Ltd
3. Ghosh, “Control Systems: Theory and Aplications”, Pearson
4. W. Bolton, “Mechatronics” Pearson Education India

BTAE/DE 611 Design of Energy Systems

L T P **Internal Marks: 40**
3 0 0 **External Marks: 60**

UNIT I ENGINEERING DESIGN: Design Process; Approaches to Engineering Design; Design for workable system, Concepts of Optimization; Economical aspects; Design Project Example; Project Management. 3

UNIT II PIPING SYSTEMS AND PUMPS: Pipe and Tubing Standards; Hydraulic Diameter; Equation of Motion for Flow in a Duct; Friction Factor and Pipe Roughness; Minor Losses; Flow Through Noncircular Cross Sections; Economic Pipe Diameter; Equivalent Length of Fittings; Pipes in Parallel; Graphical Symbols for Piping Systems; Support Systems for Pipes; Piping System Design Methodology; Flow in Pipe Networks; Water Hammer; Thermal Stresses in Pipes; Types of Pumps; Pump Testing Methods; Cavitation and its prevention, Net Positive Suction Head; Dimensional Analysis of Pumps; Specific Speed; Series and parallel pump systems; Fans and Fan Performance; Turbines and Compressors; Nozzles. 12

UNIT III HEAT EXCHANGER DESIGN CALCULATIONS: Classification; Selection of heat exchanger; Basic thermal design and theory of heat exchangers: LMTD, ε - NTU, and P – NTU method; Heat transfer and flow friction characteristics; Pressure drop analysis; Friction factor for various configurations; Pumping power; Fouling and corrosion in heat exchanger and their prevention. 10

UNIT IV DOUBLE PIPE HEAT EXCHANGERS: Type and applications of Double Pipe Heat Exchanger; Design and analysis of Double Pipe Heat Exchangers. 4

UNIT V SHELL AND TUBE HEAT EXCHANGERS: Types and applications of Shell and Tube Heat Exchangers; Design and analysis of Shell and Tube Exchangers; Increased Heat Recovery in Shell and Tube Heat Exchangers; Optimum Water Outlet. 6

UNIT VI MODELING OF ENERGY EQUIPMENT: Definition of model; Type of models; Basic steps of mathematical modeling: Background of problem, problem statement, model formulation, analytical/numerical solution, model validation, interpretation and conclusions; Use of simple mathematics, ordinary differential equations and partial differential equation to model energy equipment/systems. 5

Recommended Books:

1. Y. Jaluria: Design and Optimization of Thermal Systems, McGraw Hill, 1998.
2. W.F. Stoeker: Design of Thermal Systems, 3e, McGraw Hill, 1989.
3. B.K. Hodge and R. P. Taylor: Analysis and Design of Energy Systems, Prentice Hall, 1990.
4. A.P. Fraas and M.N. Ozisik: Heat Exchanger Design, John Wiley & Sons, 1965.
5. S. Kakac and H. Liu: Heat Exchangers: Selection, Rating and Thermal Design, CRC Press, 2002.
6. R. K. Shah and D. P. Sekulic, Fundamentals of heat exchanger design John Wiley & Sons, 2003.
7. W.J. Gajda and W.E. Biles: Engineering Modeling and Computation, Houghton Mifflin, 1980.
8. G. N. Tiwari: Solar Energy-Fundamental, Design, Modelling and Applications, Alpha Science 2002.
9. C. Jim and K.S.N. Douglas, Mathematical Modelling, Kluwer Academic Publishers, 2004.
10. W. S. Janna, Design of Fluid Thermal Systems, Cengage Learning, 2015.

BTAE/DE 612 Special Purpose Vehicles

L T P **Internal Marks: 40**
3 0 0 **External Marks: 60**

UNIT I INTRODUCTION: Need of Special Purpose Vehicles (SPV), Classification of SPV, wheel type vehicles & track type vehicles, their applications. 2

UNIT II DESIGN CONSIDERATIONS AND WORKING FEATURES OF DIFFERENT SYSTEMS OF SPV: Power system, transmission, final drive, lubrication, electrical, braking, steering, Pneumatic & hydraulic control circuits. 8

UNIT III SAFETY VEHICLES: Introduction, Construction and working features of Ambulances, Firefighting Trucks; Basic characteristics of truck crane, Mobile cranes, Telescopic cranes, Tower cranes, Truck mounted cranes, Rough terrain cranes, their stability & design features, control systems & safety devices. 12

UNIT IV MASS TRANSIT SYSTEM: Tram, Monorail, Diesel Multiple Unit (DMU), Electric Multiple Unit (EMU), Electric Trolleys, Ropeways, Metro rail. 5

UNIT V FOOD, POTABLE WATER, CHEMICALS AND OIL TRANSPORT: Constructional details and main features of Refrigerated Milk Truck, Potable water Tanker, Chemical tanker, Oil tanker. 3

UNIT VI MILITARY AND COMBAT VEHICLES: Tracked Vehicles, Articulated Vehicles, Multi-axle Vehicles; Special features and constructional details of tankers, gun carriers and transport vehicles, Power take off and special implements, All terrain vehicles. 8

Recommended Books

1. S. C. Sharma, " Construction Equipments and its Management", Khanna Publishers.
1. Y. Pokras and M. Tushnyakov, "Construction Equipment Operation & Maintenance",MIR, Moscow.
2. A. Astskhov, "Truck Cranes", MIR, Moscow.
3. E.G. Poninson, "Motor Graders", MIR, Moscow.
4. Hand book of Earth Moving Machinery - Central Water & Power Commission (Govt. of India)
5. N. Rudenko, "Material Handling Equipment", M.R. Publishers.
6. Sheldon, R.Shacket, "Electric Vehicles", Domus Books, New York
7. Nakra C.P., "Farm machines and equipments" Dhanparai Publishing company Pvt. Ltd

Reference Book:

La. S. Ageikin, "Off the Road Wheeled and Combined Traction Devices: Theory and Calculation", Ashgate Publishing Co. Ltd. 1988

BTAE/DE 614 Finite Elements Analysis

L T P **Internal Marks: 40**
3 0 0 **External Marks: 60**

UNIT I FUNDAMENTAL CONCEPTS: Introduction; Historical background; Stresses and equilibrium; Boundary conditions; Strain-displacement relations; Stress-strain relations; Temperature effects; Rayleigh-Ritz Method, Galerkin's Method, Saint Venant's Principle, Matrix algebra, Gaussian Elimination. 3

UNIT II FINITE ELEMENT MESHES: Choice of mesh; Mesh data in numerical form; Generation of mesh data; Mesh modification. 3

UNIT III ONE -DIMENSIONAL PROBLEMS: Introduction; Finite element Modeling; Coordinates and Shape Functions; Potential energy approach; The Galerkin Approach; Assembly of Global stiffness matrix and load vector; Finite element equations; Treatment of boundary conditions; Quadratic shape functions, Temperature effects. 8

UNIT IV TRUSSES: Introduction; Plane trusses; Three dimensional trusses; Assembly of global stiffness matrix for the banded and skyline solution. 6

UNIT V TWO- DIMENSIONAL PROBLEMS: Introduction, finite element modeling, constant strain triangle (CST); Problem modeling and boundary conditions. 5

UNIT VI AXISYMMETRIC SOLIDS SUBJECTED TO AXISYMMETRIC LOADING: Introduction, Axisymmetric formulation, finite element modeling: Triangular elements, Problem modeling and boundary conditions. 5

UNIT VII 2-D ISOPARAMETRIC ELEMENTS AND NUMERICAL INTEGRATION: Introduction; The four node quadrilateral, Numerical Integration, Higher order element, Problem related to beams. 4

UNIT VIII BEAMS AND FRAMES: Introduction, finite element formulation, load vector, boundary considerations, shear force and bending moment beams on elastic supports, plane frames, three dimensional frames. 5

RECOMMENDED BOOKS

1. R. C. Tirupathi and A. D. Belegundu, “Introduction to Finite Elements in Engineering” Prentice Hall, 2002.
2. C. S. Krishnamoorthy, “Finite Element Analysis -Theory and Programming” Tata McGraw-Hill Edu.
3. S.S. Rao, “The Finite Element Method in Engineering” Butterworth-Heinemann, 2005.
4. S.S. Bhavakatti, “Finite Element Analysis” New Age International Pvt. Ltd.

BTAE/DE 710 Reliability Engineering

L T P **Internal Marks: 40**
4 0 0 **External Marks: 60**

OBJECTIVE: At the end of the course a student will learn about the Reliability Engineering, dependability of reliability engineering, failure mode analysis, reliability prediction and management of a system.

UNIT I INTRODUCTION OF RELIABILITY: Concept; definition and Scope of Reliability; Performance and reliability; Reliability requirement; Reliability parameters like adequate performance, time, operating conditions and probability; Reliability verses quality and validity. 5

UNIT II RELIABILITY OF COMPONENTS AND SYSTEMS: Introduction; Mechanical stress, strength and fracture, fatigue, creep, wear, corrosion, vibration and shocks, Temperature effect; Materials and various processes. 4

UNIT III FAILURE STATISTICS FOR RELIABILITY: Failure of Engineering items; Failure classification; Causes of failure; factors influencing failure rate; failure rate and its relation to reliability; effect of design, manufacturing and assembly on failure; configuration of failure data, various terms used in failure data analysis in mathematical forms, component and system failures, uses of reliability concepts in design and maintenance of different system. Mean time to failure (MTTF), Man time between failures (MTBF). 10

UNIT IV RELIABILITY AND AVAILABILITY OF ENGINEERING SYSTEMS: Quantitative estimation of reliability of parts; Reliability of parallel and series elements; Accuracy and confidence of reliability estimation; Statistical estimation of reliability indices; Machine failure pattern, Breakdown time distribution. 10

UNIT V RELIABILITY IMPROVEMENT: Reliability in design; reliability in engineering systems, systems with spares, reliability simulation, redundant and stand by systems, confidence levels, component improvement element, unit and standby redundancy optimization and reliability-cost trade off. 8

UNIT VI FAULT TREE ANALYSIS: Introduction and importance, fault tree construction, reliability calculations from fault tree, tie set and cut set methods; numerical problems. 7

Text Books

1. R. C. Mishra, “Reliability and Maintenance Engineering”, New Age International Publication
2. R.H. Clifton, “Principles of Planned Maintenance”, Edward Arnold.
3. A Kelly, “Maintenance Planning control”, McGraw Hill.
4. L.S Srinath, “Reliability Engineering”, East West Press.
5. S.K. Sinha, “Reliability Engineering”, John Wiley.
6. Lindley R. Higgins, “Maintenance Engineering Handbook”, McGraw Hill
7. S.B. Bheem, “Reliability and Maintenance Engineering”, Vayu Education of India

BTAE/DE 711 OFF ROAD VEHICLES

L T P **Internal Marks: 40**
4 0 0 **External Marks: 60**

UNIT I INTRODUCTION AND CLASSIFICATION OF VARIOUS OFF ROAD VEHICLES

Introduction and Overview of off road vehicles; Capacity, application and requirement of off road vehicles: Earth Moving machines, Land clearing machines, scrapers and graders, Shovels, Ditchers, Tractors, Trolleys, Trailers, Platform lift truck, Fork lift trucks, Dump trucks, Truck mounted cranes, Crawler cranes, Hoisting vehicles, Multi axle vehicles. 6

UNIT II TRACTORS: General description; Specifications; functions and applications; different types of tractors like light, medium and heavy duty tractors; recent trends in tractor design; Power shift transmission and final drive in caterpillar tractor; Factors affecting efficiency of output of tractors; Troubleshooting of tractors; Merits and demerits. 12

UNIT III EARTH MOVING MACHINES AND FARM EQUIPMENTS: Constructional details and working features of various types of Earthmoving machines like Bulldozers, Cable and hydraulic dozers, Crawler crane, Dump trucks and dumpers, loaders - single bucket, Multi bucket and rotary types, excavators-drag and self - powered types, Cement Mixing Trucks, Water Tankers, Road Pavers, Land clearing machines, Bush cutters, rippers, Power and capacity of earth moving machines. 12

UNIT IV SCRAPPERS ,GRADERS, SHOVELS AND DITCHERS : Constructional details and working features of Scrapers, elevating graders, Power shovel, revolving and striper shovels, drag lines, ditchers, capacity of shovels. 8

UNIT V MILITARY RECOVERY WHEECLES: Special features and constructional details of military recovery vehicles, tankers, gun carriers and transport vehicles. 3

UNIT VI ALL WHEEL DRIVE VEHICLES: Introduction and constructional details of all wheel drive vehicles. 2

TEXT BOOKS:

1. Georing, C.E., Stone, D.W. Smith, P,K. Turnquist “Off-Road Vehicle Engineering Principles”, ASAE 2005
2. Robert L. Peurifoy, “Construction, planing, equipment and methods” Tata McGraw Hil Publishing company Ltd.
3. Nakra C.P., “Farm machines and equipments” Dhanparai Publishing company Pvt. Ltd.
4. Abrosimov K. Bran berg.A and Katayer.K., "Road making machinery", MIR Publishers.

Reference Book:

La. S. Ageikin, “Off the Road Wheeled and Combined Traction Devices: Theory and Calculation”, Ashgate Publishing Co. Ltd. 1988

BTAE/DE 712 Hybrid Vehicles

L T P **Internal Marks: 40**
4 0 0 **External Marks: 60**

UNIT I INTRODUCTION: Definition of Hybrid vehicles; Classification based on prime mover and fuel used; Advantages and Disadvantages; Efficiency; capital, operating cost and pollution comparison. 3

UNIT II ENERGY SOURCE: Basics of battery, alternatives batteries: Ni- Cd Battery, Li- ion battery, Li- polymer Battery, sodium –sulfur battery, zinc –air battery, various battery parameters and its characteristics. 6

UNIT III ALTERNATIVE ENERGY SOURCES: Fuel cells its types and characteristics, hydrogen storage systems, supercapacitors and ultracapacitors. 5

UNIT V PM AND SR MACHINES: Permanent Magnet Machines and Motors, Switched Reluctance Machines and its configuration and operation. 6

UNIT VI POWER ELECTRONICS AND MOTOR DRIVES: Power converters and drive controllers, various power electronic switches, DC drive, AC Drive and its modulation, SR motor drives, converters and its control. 8

UNIT VII ELECTRIC VEHICLE DRIVE TRAIN: EV configurations, transmission components, Steady state model of ideal Gear box, EV motor Sizing. 6

UNIT VIII HYBRID ELECTRIC VEHICLES: Introduction of hybrids and its types; Complete Design of an HEV. 6

REFERENCE BOOK

1. Robin Hardy & Iqbal Hussain “Electric and Hybrid Vehicles Design Fundamentals“, CRC press
2. S.S. Thipse, Alternative Fuels, Jaico Publications
3. Vishwanathan, B. and Aulice Scibioh, “Fuel Cells Principles and Applications, Universities Press India Pvt. Ltd. Hyderabad
4. Hamid A Toliyat, Handbook of Electric Motors, Marcel Decker Inc.

BTAE/DE 713 Automation and Mechatronics

L T P **Internal Marks: 40**
4 0 0 **External Marks: 60**

UNIT I INTRODUCTION: Concept and scope of automation: Socio economic Consideration: Low cost automation. 3

UNIT II PNEUMATIC AND HYDRAULIC SYSTEMS: Hydraulic and pneumatic power supplies, Direction control valves, Pressure control valve: pressure limiting, pressure relief and pressure sequencing valves, speed control valve, servo valves and servo systems, time delay valves, shuttle valve, Actuators: Single acting and double acting cylinders, Cushion assembly, Rotary actuators, Vane Motor, Pilot operation, Cylinders sequencing and process control. 6

UNIT III PROGRAMMABLE LOGIC CONTROLLER (PLC); Function of PLC, Architecture, Components Of PLC, selection of PLC, Ladder Logic Diagram, Logic Functions: latching, sequencing, counters, shift registers, jumpers, manipulation of data, arithmetic operations. 5

UNIT IV APPLICATION OF PERSONAL COMPUTER IN CONTROL AND AUTOMATION: Data acquisition: ADC, ADC, DAC, digital input, digital output, control of DC motor, stepper motor. 7

UNIT V ROBOTICS: Introduction, classification based on geometry, devices, control and path movements, End effectors- types and application: Sensors- types and application, Concept of Robotics/Machine vision, Teach Pendant. 7

UNIT VI INDUSTRIAL APPLICATIONS of Robots for material transfer, machine loading / unloading, welding, assembly and spray painting operations. 5

UNIT VII ELECTRICAL ACTUATION SYSTEM: MEMS, Solid State Switches, Solenoid, DC/AC Motors, Stepper Motors. 4

UNIT VIII MECHATRONIC SYSTEMS: Definition and approach of Mechatronics, Measurement and Control Systems and Mechatronics Approach. Traditional and mechatronics design, possible mechatronic design solutions, case studies. 5

Books

1. W. Bolton, “Mechatronics”, Pearson Education India
2. Mahalik , “Mechatronics”, Tata McGraw-Hill Education
3. Benjamin C. Kuo, “Automatic Control Systems”, Prentice Hall , New Delhi
4. S R Deb, “Robotics and Flexible Automation”, Tata McGraw-Hill Education
5. S R Majumdar, “Pneumatic Systems Principles and Maintenance”, Tata McGraw-Hill Education
6. Mikell P. Groover, “Automation, production systems and CIM”, PHI
7. A.K. Gupta, “Industrial Automation and Robotics”, University Science Press

BTAE/DE 714 TRANSPORT MANAGEMENT & AUTOMOTIVE INDUSTRY

L T P **Internal Marks: 40**
4 0 0 **External Marks: 60**

UNIT I Management Training and Operations: Basic principles of supervising, Organizing time and people, Job instruction training, training devices and techniques, Driver and mechanic hiring, Driver checklist, Lists for driver and mechanic, Trip leasing, Vehicle operation and types of operation. 5

UNIT II Vehicle Maintenance: Scheduled and unscheduled maintenance Planning and scope, Evaluation of PMI program, Work scheduling, Overtime, Breakdown analysis, Control of repair backlogs, Cost of options. 7

UNIT III Vehicle Parts, Supply Management and Budget: Cost of inventory, balancing inventory cost against downtime, Parts control, Bin tag systems, Time management; Time record keeping, Budget activity, Capital expenditures, Classification of vehicle expenses, Fleet management and data processing, Data processing systems- Software, Models – Computer controlling of fleet activity, Energy management. 10

UNIT IV Scheduling and Fare Structure: Route planning, Scheduling of transport vehicles, Preparation of timetable, Costs, fare structure, methods of the fare collection, Preparation of fare table. 5

UNIT V Motor Vehicle Act: Schedules and sections, Registration of motor vehicles, Licensing of drivers, Control of permit, Limits of speed, traffic signs, Constructional regulations, Description of goods carrier, delivery van, tanker, tipper, Municipal, fire fighting and break down service vehicle. 8

UNIT VI Automobile Industry: History and development of the automobile industry, market trends, current scenario in Indian auto industry, Auto ancillary industries, Role of the automobile industry in national growth. 6

BOOKS:

1. John Dolu, “Fleet Management”, McGraw Hill Co., 1984
2. Government Publication, “the Motor Vehicle Act”, 1989
3. Kitchin L. D., “Bus Operation”, IIIiffe and Sons Ltd., London, III Edition, 1992
4. Kadiyali L.R., “Traffic Engineering and Transport Planning”

BTAE/OE-1 HUMAN RESOURCE MANAGEMENT*

L T P **Internal Marks: 40**
3 0 0 **External Marks: 60**

Introduction: Introduction to Human Resource Management and its definition, functions of Human Resource Management & its relation to other managerial functions. Nature, Scope and Importance of Human Resource Management in Industry, Role & position of Personnel function in the organization.

Procurement and Placement: Need for Human Resource Planning; Process of Human Resource Planning; Methods of Recruitment; Psychological tests and interviewing; Meaning and Importance of Placement and Induction, Employment Exchanges (Compulsory Notification of vacancies) Act 1959, The Contract Labour (Regulation & Abolition) Act 1970.

Training & Development: Difference between training and Development; Principles of Training; Employee Development; Promotion-Merit v/s seniority Performance Appraisal, Career Development & Planning.

Job analysis & Design: Job Analysis: Job Description & Job Description, Job Specification.

Job Satisfaction: Job satisfaction and its importance; Motivation, Factors affecting motivation, introduction to Motivation Theory; Workers ' Participation, Quality of work life.

The Compensation Function: Basic concepts in wage administration, company's wage policy, Job Evaluation, Issues in wage administration, Bonus & Incentives, Payment of Wages Act-1936, Minimum Wages Act-1961

Integration: Human Relations and Industrial Relations; Difference between Human Relations and Industrial Relations, Factors required for good Human Relation Policy in Industry; Employee Employer relationship Causes and Effects of Industrial disputes; Employees Grievances & their Redressal, Administration of Discipline, Communication in organization, Absenteeism, Labour Turnover, Changing face of the Indian work force and their environment, Importance of collective Bargaining; Role of trader unions in maintaining cordial Industrial Relations.

Maintenance: Fringe & retirement terminal benefits, administration of welfare amenities, Meaning and Importance of Employee Safety, Accidents-Causes & their Prevention, Safety Previsions under the Factories Act 1948; Welfare of Employees and its Importance, Social security, Family Pension Scheme, ESI act 1948, Workmen's Gratuity Act 1972, Future challenges for Human Resource Management.

Recommended Text Books:
1. T.N.Chhabra- Human Resource Management (Dhanpat Rai & Co.)

Recommended Reference Books:
1. Lowin B. Flippo - Principles of personnel Management (Mc Graw-Hill)
2. R.C. Saxena - Labour Problems and social welfare (K.Math & Co.)
3. A Minappa and M. S. Saiyada - Personnel Management (Tata Mc. Graw-Hill)
4. C.B. Mamoria - Personnel Management (Himalaya Publishing House, Bombay)
5. T.N. Bhagotiwal - Economics of Labour and Industrial Relations (Sahitya Bhawan Agra)

***Same syllabus as HU-251**

BTAE/OE-2 Operation Research

L T P **Internal Marks: 40**
3 0 0 **External Marks: 60**

UNIT I -INTRODUCTION: Origin of OR and its role in solving industrial problems: General approach for solving OR problems. Classification of mathematical models: various decision making environments. 4

UNIT II - DETERMINISTIC MODELS : Formulation of deterministic linear mathematical models : Graphical and simplex techniques for solution of linear programming problems, Big M method and two phase method, Introduction to duality theory and sensitivity analysis: transportation, assignment and sequencing models; Introduction to goal programming; Solution techniques of linear goal programming problems. 10

UNIT III - PROBABILISTIC MODELS: Decision making under uncertainty: Maximum and minimum models; Introduction to decision tree. Game theory: Solution of simple two person zero-sum games: Examples of simple competitive situation. 5

UNIT IV - QUEUING THEORY: Types of queuing situation: Queuing models with Poisson's input and exponential service, their application to simple situations. 4

UNIT V - REPLACEMENT MODELS : Replacement of items that deteriorate, Replacement of items whose maintenance and repair costs increase with time, replacement of items that fail suddenly; replacement of items whose maintenance costs increase with time and value of money also changes, individual replacement policy, group replacement policy. 6

UNIT VI - NETWORK MODELS : Shortest route and traveling sales - man problems, PERT & CPM introduction, analysis of time bound project situations, construction of net works, identification of critical path, slack and float, crashing of network for cost reduction, resource leveling and smoothening. 8

Text Books:

1. H.M. Wagner, “Principles of Operations Research”, Prentice Hall.
2. P.K. Gupta and D.S. Hira, “Operations Research”, S. Chand & Co.
3. F.S. Hiller and G.I. Libermann, “Introduction to Operation Research”, Holden Ray
4. K.K. Chawla, “Operation Research”, Kalyani Publisher.

BTAE/OE-3 Industrial Engineering*

L T P **Internal Marks: 40**
3 0 0 **External Marks: 60**

UNIT I - INTRODUCTION: Definition and scope of industrial engineering, role of an industrial engineer in industry; Functions of industrial engineering department and its organization; Qualities of an industrial engineer. 3

UNIT II - **PLANT LAYOUT AND MATERIAL HANDLING:** Different types of layouts viz. Product, process and combination layouts; Introduction to layouts based on the GT, JIT and cellular manufacturing systems; Development of plant layout; Types of material handling equipment, relationship of material handling with plant layouts. 7

UNIT III - WORK-STUDY: Areas of application of work study in industry; Method study and work measurements and their inter-relationship. Reaction of management and labour to work study; Role of work study in improving plant productivity and safety. 4

UNIT IV - METHOD STUDY: Objectives and procedure for methods analysis: Select, Record, Examine, Develop, Define, Install and Maintain. Recording techniques, Micromotion and macro-motion study: Principles of motion economy, Normal work areas and work place design. 5

UNIT V - WORK MEASUREMENT: Objectives, Work measurement techniques - time study, work sampling, pre-determined motion time standards (PMTS) Determination of time standards. Observed time, basic time, normal time, rating factors, allowances, standard time. 5

UNIT VI - VALUE ENGINEERING: Types of values, concept of value engineering, phases of value engineering studies, application of value engineering. 4

UNIT VII - WORK DESIGN: Concepts of job enlargement, job enrichment and job rotation. Effective job design considering technological and behavior factors. 4

UNIT VIII - ERGONOMICS: Introduction to ergonomic considerations in designing man-machine systems with special reference to design of displays and controls. 4

Books

1. Hicks, “Industrial Engg. And management “,Tata McGraw Hill.
2. Ulrich, “Product Design and Development”,Tata McGraw Hill
3. Suresh Dalela and Saurabh, “Work Study and ergonomics”, Standard Publishers.
4. R. Bernes, “Motion and time study”, John Wiley and sons.
5. D. J. Oborne, “Ergonomics at work”, John Wiley and sons.
6. Work study by ILO

***Same syllabus as BTPE-601**

BTAE/OE-4 Total Quality management*

L T P **Internal Marks: 40**
3 0 0 **External Marks: 60**

Detailed Contents

1. Quality and Total Quality Management; Excellence in manufacturing/service, factors of excellence, relevance of TQM. 2

2. Concept and definition of quality; total quality control (TQC) and Total Quality Management (TQM), salient features of TQC and TQM. Total Quality Management Models, benefits of TQM. 5

3. Just-in-time (JIT): Definition, Elements, benefits, equipment layout for JIT system, Kanban system MRP (Material Requirement planning) vs JIT system, Waste elimination, workers involvement through JIT: JIT cause and effect chain, JIT implementation. 6

4. Customer: Satisfaction, data collection and complaint, redressal mechanism. 3

5. Planning Process: Policy development and implementation; plan formulation and implementation. 4

6. Process Management: Factors affecting process management, Quality function development (QFD), and quality assurance system. 3

7. Total Employees Involvement (TEI): Empowering employees: team building; quality circles; reward and Recognition; education and training, Suggestion schemes. 4

8. Problems solving Defining problem; Problem identification and solving process; QC tools. 3

9. Benchmarking definition, concept, process and types of benchmarking. 2

10. Quality Systems: Concept of quality system standards: relevance and origin of ISO 9000; Benefits; Elements of ISO 9001, ISO 9002, ISO 9003. 4

11. Advanced techniques of TQM: Design of experiments: failure mode effect analysis: Taguchi methods 4

BOOKS:

1. Total Quality Management by sunder Raju, Tata Mcgraw Hill
2. TQM for engineers by M.Zairi, Aditya Books
3. Total Quality Management Handbook by J.L. Hradeskym MCGraw Hill
4. ISO 9000 quality System by Dalela and Saurabh, standard Publishers

***Same syllabus as ME-251**

BTAE/OE-5 Material Management

L T P **Internal Marks: 40**
3 0 0 **External Marks: 60**

OBJECTIVE: To expose the students to the different components and functions of material management. Students will also some to know about Inventory control procedures, Codification of materials, Purchase policies and procedures.

UNIT I INTRODUCTION: Concept and importance of Material Management, Various types of common materials and their functions, Requirements of Automotive materials, significance of specifications, standardization, Creep, fatigue and corrosion, make or buy decision, buying process. 5

UNIT II MATERIALS PLANNING AND CONTROL: Material forecasting, selection of materials and inventory control, Spare parts management, Inventory Models: Basic EOQ model, ABC analysis, statistical methods in inventory control, lead time analysis, administrative lead time, supplier lead time, transport lead time and inspection lead time-flow charting techniques to reduce various types of lead time, materials requirement planning, aggregate inventory management. Codification of materials, 10

UNIT III STORAGE AND WARE HOUSE MANAGEMNET: Objectives, duties and responsibilities of storekeeper, storage design, stores layout, storage systems and equipment, stores preservation, stores procedures, stock valuation and verification, store ledger, ware housing and distribution management. Cost control and cost reduction programme. 8

UNIT IV PURCHASE FUNCTION: Purchasing policies and procedures, legal aspects of purchasing, selection of sources of supply: vendor evaluation and rating, vendor development, price, cost analysis. 6

UNIT V MATERIALS ACCOUNTING AND BUDGETING: Evaluation of materials management performance, Information systems and computer in materials management. 4

UNIT VI INTRODUCTION TO ADVANCED MATERIALS: Ni and Co based super alloys, Special steels, Titanium alloys, Intermetallics, ceramics and their composites. 3

TEXT BOOK

1. P. Gopalakrishnan, Purchasing and Materials Management, Tata McGraw Hill, 1990.
2. M.M. Verma, Materials Management, S. Chand and Co.

REFERENCE BOOKS

1. Camer Lee and Donald M Dubbler, Purchasing and Materials Management, Text and cases, Tata McGraw Hill, 1997.
2. Mark, J. V., Operations Management, McGraw Hill Publishers, 1984.
3. Westing, J. K., Fine, E.V. and Zone, C.T., Purchasing Management Principles, John Wiley & Sons, New York, 1986
4. Michael F. Ashby: Materials Selection in Mechanical Design, Butterworth Heinemann, 2005.