OPERATION RESEARCH

[AS PER CHOICE BASED CREDIT SYSTEM (CBCS) SCHEME]

Subject Code	:	15MA71	IA Marks	:	20
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	50	Exam Marks	:	80

MODULE -1

Introduction: Evolution of OR, Definitions of OR, Scope of OR, Applications of OR, Phases in OR study. Characteristics and limitations of OR, models used in OR, Linear Programming Problem (LPP), Generalized LPP- Formulation of problems as L.P.P. Solutions to LPP by graphical method (Two Variables). **08 Hours**

MODULE -2

LPP: Simplex method, Canonical and Standard form of LP problem, slack, surplus and artificial variables, Solutions to LPP by Simplex method, Big-M Method and Two Phase Simplex Method, Degeneracy in LPP. Concept of Duality, writing Dual of given LPP. Solutions to L.P.P by Dual Simplex Method. **12 Hours**

MODULE -3

Transportation Problem: Formulation of transportation problem, types, initial basic feasible solution using North-West Corner rule, Vogel's Approximation method. Optimality in Transportation problem by Modified Distribution (MODI) method. Unbalanced T.P. Maximization T.P. Degeneracy in transportation problems, application of transportation problem.

Assignment Problem- Formulation, Solutions to assignment problems by Hungarian method, Special cases in assignment problems, unbalanced, Maximization assignment problems. Travelling Salesman Problem (TSP). Difference between assignment and T.S.P, Finding best route by Little's method. Numerical Problems. **12 Hours**

MODULE -4

Network analysis: Introduction, Construction of networks, Fulkerson's rule for numbering the nodes, AON and AOA diagrams; Critical path method to find the expected completion time of a project, determination of floats in networks, PERT networks, determining the probability of completing a project, predicting the completion time of project; Cost analysis in networks. Crashing of networks- Problems.

Queuing Theory: Queuing systems and their characteristics, Pure-birth and Pure-death models (only equations), Kendall & Lee's notation of Queuing, empirical queuing models – Numerical on M/M/1 and M/M/C Queuing models. **10 Hours**

MODULE -5

Game Theory: Definition, Pure Strategy problems, Saddle point, Max-Min and Min-Max criteria, Principle of Dominance, Solution of games with Saddle point. Mixed Strategy problems. Solution of 2X2 games by Arithmetic method, Solution of 2Xn m and mX2 games by graphical method. Formulation of games.

Sequencing: Basic assumptions, Johnson's algorithm, sequencing 'n' jobs on single machine using priority rules, sequencing using Johnson's rule-'n' jobs on 2 machines, 'n' jobs on 3 machines, 'n' jobs on 'm' machines. Sequencing of 2 jobs on 'm' machines using graphical method. **08 Hours**

TEXT BOOKS:

1. Operations Research, P K Gupta and D S Hira, S. Chand and Company LTD. Publications, New Delhi – 2007

2. Operations Research, An Introduction, Seventh Edition, Hamdy A. Taha, PHI Private Limited, 2006.

REFERENCE BOOKS:

1. Operations Research, Theory and Applications, Sixth Edition, J K Sharma, Trinity Press, Laxmi Publications Pvt. Ltd. 2016.

2. Operations Research, Paneerselvan, PHI

3. Operations Research, A M Natarajan, P Balasubramani, Pearson Education, 2005

4. Introduction to Operations Research, Hillier and Lieberman, 8th Ed., McGraw Hill

Scheme of Examination: Two questions to be set from each module. Students have to answer five full questions, choosing at least one full question from each module.

HYDRAULIC CIRCUITS AND PROGRAM LOGIC CONTROLLERS

[AS PER CHOICE BASED CREDIT SYSTEM (CBCS) SCHEME]

Subject Code	:	15MA72	IA Marks	:	20
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	80

Module 1: Introduction to Fluid Power Systems

Fluid power system: components, advantages and applications. Transmission of power at static and dynamic states. Pascal's law and its applications.

Fluids for hydraulic system: types, properties, and selection. Additives, effect of temperature and pressure on hydraulic fluid. Seals, sealing materials, compatibility of seal with fluids. Types of pipes, hoses, and quick acting couplings. Pressure drop in hoses/pipes. Fluid conditioning through filters, strainers; sources of contamination and contamination control; heat exchangers. **10 Hours**

Module 2: Pumps and Actuators

Pumps: Classification of pumps, Pumping theory of positive displacement pumps, construction and working of Gear pumps, Vane pumps, Piston pumps, fixed and variable displacement pumps, Pump performance characteristics, pump selection factors, problems on pumps. Accumulators: Types, selection/ design procedure, applications of accumulators. Types of Intensifiers, Pressure switches /sensor, Temperature switches/sensor, Level sensor. **Actuators:** Classification cylinder and hydraulic motors, Hydraulic cylinders, single and double acting cylinder, mounting arrangements, cushioning, special types of cylinders, problems on cylinders. Construction and working of rotary actuators such as gear, vane, piston motors, and Hydraulic Motor. Theoretical torque, power, flow rate, and hydraulic motor performance; numerical problems. Symbolic representation of hydraulic actuators (cylinders and motors). **10 Hours**

Module 3: Components and Hydraulic Circuit Design

Components: Classification of control valves, Directional Control Valves-symbolic representation, constructional features of poppet, sliding spool, rotary type valves solenoid

and pilot operated DCV, shuttle valve, and check valves. Pressure control valves - types, direct operated types and pilot operated types. Flow Control Valves -compensated and non-compensated FCV, needle valve, temperature compensated, pressure compensated, pressure and temperature compensated FCV, symbolic representation. **Hydraulic Circuit Design:** Control of single and Double -acting hydraulic cylinder, regenerative circuit, pump unloading circuit, double pump hydraulic system, counter balance valve application, hydraulic cylinder sequencing circuits, cylinder synchronizing circuit using different methods, hydraulic circuit for force multiplication; speed control of hydraulic cylinder-metering in, metering out and bleed off circuits. Pilot pressure operated circuits. Hydraulic circuit examples with accumulator. **12 Hours**

Module 4: Pneumatic Power Systems

Introduction to Pneumatic systems: Pneumatic power system, advantages, limitations, applications, Choice of working medium. Characteristics of compressed air and air compressors. Structure of pneumatic control System, fluid conditioners-dryers and FRL unit. **Pneumatic Actuators:** Linear cylinder – types of cylinders, working, end position cushioning, seals, mounting arrangements, and applications. Rotary cylinders- types, construction and application, symbols. **Pneumatic Control Valves:** DCV such as poppet, spool, suspended seat type slide valve, pressure control valves, flow control valves, types and construction, use of memory valve, Quick exhaust valve, time delay valve, shuttle valve, twin pressure valve, symbols. **10 Hours**

Module 5: Programmable Logic Controller

Fundamentals of programmable logic controller – Functions of PLCs – PLC operations – Evaluation of the modern PLC – Memory– Selection of PLC – Features of PLC – Architecture – Basics of PLC programming – Developing Fundamental wiring diagrams – Problem solving using logic ladder diagrams – communication in PLCs – Programming Timers – Programming counters – Data Handling. PLC modules - Advanced PLCs. **10 Hours**

TEXT BOOKS:

1. Anthony Esposito, “Fluid Power with applications”, Pearson edition, 2000.

2. Majumdar S.R., “Oil Hydraulics”, Tala McGRaw HllL, 2002 .

3. Majumdar S.R., “Pneumatic systems - Principles and Maintenance”, Tata McGraw-Hill, New Delhi, 2005.

4. “PLC and Industrial application”, Madhuchhandan Gupta and SamarjitSen Gupta, pernram international pub. (Indian) Pvt. Ltd., 2011.

REFERENCE BOOKS:

1. John Pippenger, Tyler Hicks, “Industrial Hydraulics”, McGraw Hill International Edition, 1980.

2. Andrew Par, Hydraulics and pneumatics, Jaico Publishing House, 2005.

3. FESTO, Fundamentals of Pneumatics, Vol I, II and III.

4. Herbert E. Merritt, “Hydraulic Control Systems”, John Wiley and Sons, Inc.

5. Thomson, Introduction to Fluid power, Prentcie HaIl, 2004

6. John Watton, “Fundamentals of fluid power control”, Cambridge University press, 2012.

7. GaryDunning,”Introduction to Programmable Logic Controllers”, Thomson,2nd Edition.

8. John W Webb, Ronald A Reis, ”Programmable Logic Controllers: Principles and Application”, PHI Learning, New Delhi, 5th Edition

CONTROL ENGINEERING

[AS PER CHOICE BASED CREDIT SYSTEM (CBCS) SCHEME]

Subject Code	:	15MA73	IA Marks	:	20
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	80

MODULE I

Introduction: Concept of automatic controls, Open loop and closed loop systems, Concepts of feedback, requirements of an ideal control system, Types of controllers-Proportional, Integral, Differential, Proportional & Integral, Proportional Differential and Proportional Integral Differential controllers (Basic Concepts Only). **6 Hours**

MODULE 2

Modeling of Physical Systems: Mathematical Models of Mechanical, Electrical, Thermal, Hydraulic and Pneumatic Systems. **3 Hours**

Analogous Systems: Direct and inverse analogs for mechanical, thermal and fluid systems. **4 Hours**

Block diagram Algebra: General representation of a feedback control system, transfer functions, rules of block diagram algebra, reduction of block dia. to obtain closed loop transfer function.

Signal flow graphs: Mason's gain formula **6 Hours**

MODULE 3

Steady state operation: Steady state analysis for general block dia. for a control system, steady state characteristics, equilibrium in a system. **3 Hours**

Transient Response: Transient response and steady state analysis of unit, step input, general operational representation for a differential equation of control system, distinct, repeated and complex conjugate zeros, general form of transient response, Routh's stability criterion for a control system. **4 Hours**

Root Locus Plots: Root locus method: Significance of Root locus, angle and magnitude conditions, breakaway points, angles of departure and arrival, construction of Root locus using general rules and steps, Lead and Lag compensation **6 Hours**

MODULE 4

Frequency Domain Analysis: Relationship between time and frequency response, Polar plot, Bode's Plot, Nyquist plot and Nyquist stability criterion, Relative Stability, Phase and Gain Margins **12 Hours**

MODULE 5

System Compensation and State Variable Characteristics of Linear Systems: Series and feedback compensation, Introduction to state concepts, state equation of linear continuous data system. Matrix representation of state equations, controllability and observability, Kalman and Gilberts test. **8 Hours**

TEXT BOOKS:

1. **Modern Control engineering** – K. Ogatta, Prentice Hall (India), Pearson Education 2003.
2. **Automatic Control Systems** – Francis. H. Raven 5th Ed. McGrawHill 1995.

REFERENCE BOOKS:

1. **Feedback Control Systems** – Schaum's series.
2. **Control Systems** - I.J. Nagarath & M. Gopal, New age International Publishers.
3. **Control Systems** - M. Gopal, Tata McGraw Hill, New Delhi, 2nd Edition, 2002.
4. **Control System Engineering** - S.N. Sivanandom Vikas Publishing House. New Delhi, 2001.
5. **Modern Control Systems** - Rihard C. Drof and Robert. H. Bishop Addison – Wesley, 8th Edition. 1998.
6. **Automatic Control Systems** – B.C. Kuo Prentice Hall (India), 1995.
7. **System Dynamics & Control** - Eronini Umez-Eronini Thomson Learning 2002.

PROFESSIONAL ELECTIVE – III

FACILITY PLANNING AND DESIGN

[AS PER CHOICE BASED CREDIT SYSTEM (CBCS) SCHEME]

Subject Code	:	15MA751	IA Marks	:	20
No. of Lecture Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Lecture Hrs.	:	50	Exam Marks	:	80

MODULE 1

PLANT LOCATION AND LAYOUT: Factors influencing plant location, Theories of plant location and location economics. **PLANT LAYOUT:** Objectives of plant layout, Principles of plant layout, types of plant layout, their merits and demerits.

MATERIAL HANDLING: Definition, principles, system design and selection of equipment, **UNIT** load concepts, basic layout types – immer, Nadler, Muther, Apple James and Ree's approaches to plant layout, Modular design concept, Production Line balancing.

10 Hours

MODULE 2

COMPUTER AIDED LAYOUT: CRAFT, COFAD, PLANET, CORELAP, ALDEP.

CONSTRUCTION OF THE LAYOUT: Methods of constructing the layout, evaluation of layout, efficiency indices, presenting layout to management, implementing layout.

10 Hours

MODULE 3

SPACE DETERMINATION AND AREA ALLOCATION: Factors for consideration in space planning, receiving, storage, production, shipping, other auxiliary service actions, Establishing total space requirement, area allocation factors to be considered, expansion, flexibility, aisles column and area allocation procedure. Design of layout using Travel chart, plot plan, block plan, Sequence demand straight line method and non-directional method.

10 Hours

MODULE 4

QUANTITATIVE APPROACHES TO FACILITIES PLANNING: Deterministic models – Single and multi facility location models, Location allocation problems.

QUANTITATIVE APPROACHES TO FACILITIES PLANNING: Quadratic assignment problem, Warehouse layout models, plant location problems. Conveyor models. Storage models.

10 Hours

MODULE 5

PROBABILISTIC MODELS: Conveyor models, waiting line models and simulation models. Evaluation, selection, implementation and maintenance of the facilities plan.

10 Hours

TEXT BOOKS:

1. **Facilities Planning** -Thompkins. J A and White, J. A.
2. **Facility layout and Location** -Francies, R.L. and White, J.A..
3. **Plant Layout and Material handling** -James M Apple, 2nd Edition, John, Wiely and Sail.

REFERENCE BOOKS:

1. **Practical plant layout** -Muther Richard, - McGraw Hill-1955.
2. **Facilities Design** -Sunderesh Heragu, , PWS Publishing Company, ISBN- 0-534-95183.
3. **Plant Layout Design** -James M Moore., Mac Millon Co. 1962 LCCCN : 61-5204.

NON TRADITIONAL MACHINING

[AS PER CHOICE BASED CREDIT SYSTEM (CBCS) SCHEME]

Subject Code	:	15MA752	IA Marks	:	20
No. of Lecture Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Lecture Hrs.	:	50	Exam Marks	:	80

MODULE 1

INTRODUCTION: Introduction to Non-traditional machining, Need for Non-traditional machining process, Comparison between traditional and non-traditional machining, general classification Nontraditional machining processes, classification based on nature of energy employed in machining, selection of non-traditional machining processes, Specific advantages, limitations and applications of non-traditional machining processes. **08 hours**

MODULE 2

Ultrasonic Machining (USM): Introduction, Equipment and material process, Effect of process parameters: Effect of amplitude and frequency, Effect of abrasive grain diameter, effect of slurry, tool & work material. Process characteristics: Material removal rate, tool wear, accuracy, surface finish, applications, advantages & limitations of USM. Abrasive Jet Machining (AJM): Introduction, Equipment and process of material removal, process variables: carrier gas, type of abrasive, work material, stand-off distance (SOD).Process characteristics-Material removal rate, Nozzle wear, accuracy & surface finish. Applications, advantages & limitations of AJM. Water Jet Machining (WJM): Equipment & process, Operation, applications, advantages and limitations of WJM. **10 hours**

MODULE 3

ELECTROCHEMICAL MACHINING (ECM): Introduction, Principle of electro chemical machining: ECM equipment, elements of ECM operation, Chemistry of ECM. ECM Process characteristics: Material removal rate, accuracy, surface finish. Process parameters: Current density, Tool feed rate, Gap between tool & work piece, velocity of electrolyte flow, type of electrolyte, its concentration temperature, and choice of electrolytes. ECM Tooling: ECM tooling technique & example, Tool & insulation materials. Applications ECM: Electrochemical grinding and electrochemical honing process. Advantages, disadvantages and application of ECG, ECH. CHEMICAL MACHINING (CHM) Elements of the process: Resists (maskants), Etchants. Types of chemical machining process chemical blanking process, chemical milling process. Process characteristics of CHM: material removal rate, accuracy, surface finish, advantages, limitations and applications of chemical machining process. **12 hours**

MODULE 4

ELECTRICAL DISCHARGE MACHINING (EDM) Introduction, mechanism of metal removal, EDM equipment: spark erosion generator (relaxation type), dielectric medium-its functions & desirable properties, electrode feed control system. Flushing types; pressure flushing, suction flushing, side flushing, pulsed flushing. EDM process parameters: Spark frequency, current & spark gap, surface finish, Heat Affected Zone. Advantages, limitations & applications of EDM, Electrical discharge grinding, Traveling wire EDM. **PLASMA ARC MACHINING (PAM)** Introduction, non-thermal generation of plasma, equipment mechanism of metal removal, Plasma torch, process parameters, process characteristics. Safety precautions. Safety precautions, applications, advantages and limitations. **10 hours**

MODULE 5

LASER BEAM MACHINING (LBM) Introduction, generation of LASER, Equipment and mechanism of metal removal, LBM parameters and characteristics, Applications, Advantages & limitations. ELECTRON BEAM MACHINING (EBM) Introduction, Principle, equipment and mechanism of metal removal, applications, advantages and limitations. **10 hours**

Text Books:

1. Modern Machining Process by P.C Pandey and H S Shah, McGraw Hill Education India Pvt. Ltd. 2000

2. Production technology, HMT, McGraw Hill Education India Pvt. Ltd. 2001

Reference Books

1. New Technology, Dr. Amitabha Bhattacharyya, The Institute of Engineers (India), 2000

2. Modern Machining process, Aditya, 2002.

PROCESS PLANNING

[AS PER CHOICE BASED CREDIT SYSTEM (CBCS) SCHEME]

Subject Code	:	15MA753	IA Marks	:	20
No. of Lecture Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Lecture Hrs.	:	50	Exam Marks	:	80

MODULE 1

INTRODUCTION TO PROCESS PLANNING

Introduction- methods of process planning-Drawing interpretation-Material evaluation – steps in process selection-.Production equipment and tooling selection

MODULE 2

PROCESS PLANNING ACTIVITIES

Process parameters calculation for various production processes-Selection jigs and fixtures election of quality assurance methods - Set of documents for process planning-Economics of process planning- case studies

MODULE 3

INTRODUCTION TO COST ESTIMATION

Importance of costing and estimation –methods of costing-elements of cost estimation – Types of estimates – Estimating procedure- Estimation labor cost, material cost- allocation of over head charges- Calculation of depreciation cost

MODULE 4

PRODUCTION COST ESTIMATION

Estimation of Different Types of Jobs - Estimation of Forging Shop, Estimation of Welding Shop, Estimation of Foundry Shop

MODULE 5

MACHINING TIME CALCULATION

Estimation of Machining Time - Importance of Machine Time Calculation- Calculation of Machining Time for Different Lathe Operations ,Drilling and Boring - Machining Time Calculation for Milling, Shaping and Planning -Machining Time Calculation for Grinding

TEXT BOOKS:

1. Peter scalon, “Process planning, Design/Manufacture Interface”, Elsevier science technology Books, Dec 2002.

REFERENCES:

1. Ostwalal P.F. and Munez J., “Manufacturing Processes and systems”, 9th Edition, John Wiley, 1998.
2. Russell R.S and Tailor B.W, “Operations Management”, 4th Edition, PHI, 2003.
3. Chitale A.V. and Gupta R.C., “Product Design and Manufacturing”, 2nd Edition, PHI, 2002.

PRECISION ENGINEERING

[AS PER CHOICE BASED CREDIT SYSTEM (CBCS) SCHEME]

Subject Code	:	15MA754	IA Marks	:	20
No. of Lecture Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Lecture Hrs.	:	50	Exam Marks	:	80

MODULE 1

CONCEPTS OF ACCURACY AND MACHINE TOOLS

Part Accuracy – errors, accuracy of machine tools – spindle accuracy – displacement accuracy – errors due to numerical interpolation – definition of accuracy of N.C system – errors in the NC machines – feed stiffness – zero stability.

MODULE 2

STIFFNESS, THERMAL EFFECTS AND FINISH MACHINING Overall stiffness of Lathe – compliance of work piece – errors caused by cutting forces – deformation in turning – boring – milling – heat sources – thermal effects – Finish Turning, boring, grinding – Surface roughness.

MODULE 3

DIMENSIONING

Definition of terms – Key dimension – Superfluous dimension – dimensional stepped shaft – assigning tolerances in the constituent dimensions – dimensional chains.

MODULE4

MICRO-MACHINING MICRO-FABRICATION

Micro Machining – Photo resist process – Lithography – LIGA Process – Optical, processing of materials – electron beam machining – beam machining – micro forming, diamond turning – micro positioning devices – etching – physical vapour deposition – Chemical vapour deposition

MODULE 5

SMART STRUCTURES, MATERIALS AND MICRO ACTUATORS

Smart structures – Smart materials types and applications – smart sensors – micro valves – MEMS – Micro motors – Micro pumps – micro dynamometer – micro machines – micro optics – micro nozzles.

TEXT BOOKS:

1. Murthy R.L., “Precision Engineering in Manufacturing”, New Age International Pvt, 2005.

2. Juliar W.Gardner. Vijay K. Varadan, “Micro sensors, MEMS and Smart Devices”, John Wiley and sons, 2001.

REFERENCES:

1. Stephen A. Campbell,“The Science and Engineering of Microelectronic Fabrication”, Oxford University Press, 1996.
2. Raady Frank, “Understanding Smart Sensors”, Artech. House, Boston, 1996.
3. MEMS Hand Book, CRC Press, 2001

PROFESSIONAL ELECTIVE – IV

OPERATION MANAGEMENT

[AS PER CHOICE BASED CREDIT SYSTEM (CBCS) SCHEME]

Subject Code	:	15MA761	IA Marks	:	20
No. of Lecture Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Lecture Hrs.	:	50	Exam Marks	:	80

MODULE 1

OPERATION MANAGEMENT CONCEPTS: Introduction, Historical development, The trend: information and Non- manufacturing systems, Operations management, Factors affecting productivity; International dimensions of productivity, the environment of operations, Production systems decisions – a look ahead.

OPERATION DECISION MAKING: Introduction, Management as a science, Characteristics of decisions, Framework for decision making, Decision methodology, Decision support systems, Economic Models, Statistical models. **12 Hours**

MODULE 2

SYSTEMS DESIGN AND CAPACITY: Introduction, Manufacturing and service systems, Design and systems capacity, Capacity planning.

FORECASTING DEMAND: Forecasting objectives and use, Forecasting variables, Opinion and Judgemental methods, Time series methods, Exponential smoothing, Regression and correlation method, application and control of forecasts. **10 Hours**

MODULE 3

AGGREGATE PLANNING AND MASTER SCHEDULING: Introduction – Planning and scheduling, Objectives of aggregate planning, aggregate planning methods, Master scheduling objectives, Master scheduling methods. **8 Hours**

MODULE 4

MATERIAL AND CAPACITY REQUIREMENTS PLANNING: Overview: MRP and CRP, MRP: Underlying concepts, System parameters, MRP logic, System refinements, Capacity management, CRP activities. **8 Hours**

MODULE 5

SCHEDULING AND CONTROLLING PRODUCTION ACTIVITIES: Introduction, PAC objectives and data requirements, Scheduling strategy and guidelines, Scheduling methodology, Priority control, Capacity control.

SINGLE MACHINE SCHEDULING: Concept, measures of performance, SPT rule, Weighted SPT rule, EDD rule, Minimizing the number of tardy jobs.

FLOW – SHOP SCHEDULING: Introduction, Johnson's rule for 'n' jobs on 2 and 3 machines, CDS heuristic.

JOB-SHOP SCHEDULING: Types of schedules, Heuristic procedure, scheduling 2 jobs on 'm' machines. **12 Hours**

TEXT BOOKS:

1. **Operation Managemen** - Monks, J.G., t, McGraw-Hill International Editions, 1987.
2. **Production and Operations Management** - Pannerselvam. R., PHI.
3. **Operations management** - Productions & by Adam & Ebert.

REFERENCE BOOKS:

1. **Operations Management** - Buffa, Modern Production/, Wiely Eastern Ltd.
2. **Production and Operations Management** - Chary, S.N., , Tata-McGraw Hill
3. **Operations management** - James Dilworth.

RELIABILITY ENGINEERING

[AS PER CHOICE BASED CREDIT SYSTEM (CBCS) SCHEME]

Subject Code	:	15MA762	IA Marks	:	20
No. of Lecture Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Lecture Hrs.	:	50	Exam Marks	:	80

MODULE 1

CONCEPTS OF RELIABILITY, SYSTEM AND MODELS

Definition of reliability – reliability Vs quality-reliability function-MTTF – hazard rate function- bathtub curve – derivation of the reliability function-constant failure rate model – time dependent failure models. Weibull distribution – normal distribution – the lognormal distribution. Serial configuration – parallel configuration – combined series parallel systems – system structure function, minimal cuts and minimal paths – Markov analysis – load sharing systems, standby system, degraded systems, three state devices – covariate models, static models, dynamic models, physics of failure models. **12 Hours**

MODULE 2

DESIGN FOR RELIABILITY AND MAINTAINABILITY

Reliability design process – system effectiveness – economic analysis and life cycle cost – reliability allocation – optimal, Arinc, Agree, – Design methods – parts and material selection, derating, stress- strength analysis – failure analysis – identification of failure mode – determination of causes –assessment of effects – classification of seventy – computation of critically index – corrective action – system safety and FTA. Analysis of downtime – the repair time distribution – stochastic point processes – system repair time – reliability under preventive maintenance – state dependent systems with repair – MTTR-mean system downtime – MTR – MH/OH – cost model – fault isolation and self diagnostics – repair Vs replacement – replacement model – proactive, preventive, predictive maintenance – maintenance and spares provisioning – maintainability prediction and demonstration – concepts and definition of availability. **12 Hours**

MODULE 3

OPTIMIZATION OF SYSTEM RELIABILITY

Optimization techniques for system reliability with redundancy – heuristic methods applied to optimal system reliability- redundancy allocation by dynamic programming – reliability optimization by non linear programming. **8 Hours**

MODULE 4

THE ANALYSIS OF FAILURE DATA AND RELIABILITY TESTING

Data collection – empirical methods – ungrouped and grouped complete, censored data – static life estimation – test time calculation – burn in testing, acceptance, sequential, binomial testing – accelerated life testing – their acceleration models – experimental design –

reliability growth process – idealized growth curve – various growth models – identifying failure and repair distributions. **8 Hours**

MODULE 5

PACKAGING AND TRANSPORTATION FOR RELIABILITY

Objectives – preservation-packaging – transportation and subsequent storage – reliability and the customer – Purchase of equipment – installation – commissioning a new system – reliability prediction and control – reliability management – the people concerned with reliability, coordination, training. **10 Hours**

TEXT BOOKS:

1. Charles E. Ebling, "An introduction to Reliability and Maintainability Engg", Tata McGraw-Hill, 2000.

REFERENCES:

1. Patrick D T o'connor, "Practical Reliability Engineringt", John-Wiley and Sons inc, 2002.
2. David J Smith, "Reliability, Maintainability and Risk: Practical Methods for Engineers", Butterworth, 2002
3. Way kuo, Rajendra Prasad V, Frank A and Tillman, ching- lai Hwang "Optimal Reliability Design and Applciations", Cambridge University Press P ltd., 2001.
4. Srinath I.S, Engineering Design and Reliability, ISTE, 1999.
5. Oleg Vinogradov, "Introduction to Mechanical Reliability: A Designers Approach, Hemisphere Publications, 1991.

MATERIALS MANAGEMENT

[AS PER CHOICE BASED CREDIT SYSTEM (CBCS) SCHEME]

Subject Code	:	15MA763	IA Marks	:	20
No. of Lecture Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Lecture Hrs.	:	50	Exam Marks	:	80

MODULE - 1

Introduction: Dynamics of Materials Management - Materials Management at Micro-level, Materials Management at Macro-level. Definition of Material Management Systems Approach to Materials Management: Systems Approach - The Process of Management and the Materials Function, The Materials Function, Interfaces. Benefits of the Integrated Systems Approach. **10 Hours**

MODULE - 2

Forecasting, Objectives and the Materials Organization: Systems Design, Integral Control of the Flow of Materials, Forecasting and Planning, Forecasting Methods, Objectives of Materials Management - Organization of Materials Management, Functional Organization Model for Materials Management. Materials Planning: Making the Materials Plan Work, The Materials Cycle and Flow Control System. Purchasing: Purchasing Principles, Procedures and Practices, Fundamental Objectives of Purchasing - Scope, Responsibility and Limitations, Sources of Supply and Supplier Selection, Purchasing Policy and Procedures.

10 Hours

MODULE -3 Purchasing in Materials Management System Concept: Price Determination, Price Forecasting, Price-Cost Analysis, Negotiation, Reciprocity, Cost-Plus Contracts, Hedging, Forward Buying, Buying Ethics, Principles and Standards of Purchasing, Make-or-Buy, Information, Documentation and Purchasing Library, Legal Aspects of Purchasing, Law of Agency, Law of Contract, Legal Status of the Buyer, Warranties and Conditions, Right of Inspection, Right of Rejection, Vendor-Vendee Relations, Vendor Development, Vendor Rating, Purchasing and Procurement Activities under Materials Management: Supplier Quality Assurance Programme, Buyer-Supplier Relationship. Incoming Material Quality Control: Significance of Inspection, Metrology or Engineering Measurement, Purchase Inspection, Sampling Inspection, Sampling Technique, Different Types of Population, Different Types of Sampling. **10 Hours**

MODULE - 4 Purchasing Capital Equipment, Plant and Machinery: Responsibility and Decision, Purchasing v/s Leasing, International Buying, Import Purchasing, and Governmental Purchasing: Industrial Needs, Import Procedure and Documents, Basis of Licensing, Import Purchasing Procedures, Letter of Credit, Income-Tax Clearance, Customs

Tariff-Registration of Licenses at Port. Governmental Purchasing: Policy and Procedures, Tenders. Registration of Firms, Procedure for Registration, Terms of Registration, Removal of the Firms from the List, Blacklisting of Firms, Banning of Firms, Suspension of Firms. Inventory Management and Control Systems: Definition of Inventories, The Need for Inventory Audits Control, Types of Inventories, Inventory Control, Max-Min System, Inventories and Demand Uncertainty, Determining Safety Stock. **10 Hours**

MODULE-5 Q-system or Quantity Control System or Re-order Point System-Effect of Quantity Discounts, P-system or Periodic Review or Periodic Count System or Replenishment System, Optional Replenishment System or "S, s" Policy. Discussion on ABC Analysis, advantages and disadvantages. MRP system and MPS system Stores Management and Operation: Storage System, Stores Location and Layout, Materials Management Information System and Computer: MIS - Management and MM, Computer System for MIS and MM, In-process Materials and Management Control. **10 Hours**

Text Book: A.K. Datta., Materials Management, PHI Pvt. Ltd, New Delhi, 2001.

Reference Book: P. Gopalakrishnan, Handbook of Materials Management, PHI Pvt. Ltd, New Delhi, 2002.

SMART MATERIALS

[AS PER CHOICE BASED CREDIT SYSTEM (CBCS) SCHEME]

Subject Code	:	15MA764	IA Marks	:	20
No. of Lecture Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Lecture Hrs.	:	50	Exam Marks	:	80

MODULE 1

Introduction: Closed loop and Open loop Smart Structures. Applications of Smart structures, Piezoelectric properties. Inchworm Linear motor, Shape memory alloys, Shape memory effect-Application, Processing and characteristics. Shape Memory Alloys: Introduction, Phenomenology, Influence of stress on characteristic temperatures, Modelling of shape memory effect. Vibration control through shape memory alloys. Design considerations, multiplexing embedded NiTiNOL actuators.

MODULE 2

Electro rheological and Magneto rheological Fluids: Mechanisms and Properties, Characteristics, Fluid composition and behaviour, Discovery and Early developments, Summary of material properties. Applications of ER and MR fluids (Clutches, Dampers, others). Fibre Optics: Introduction, Physical Phenomenon, Characteristics, Fibre optic strain sensors, Twisted and Braided Fibre Optic sensors, Optical fibres as load bearing elements, Crack detection applications, Integration of Fibre optic sensors and shape memory elements.

MODULE 3

Vibration Absorbers: Introduction, Parallel Damped Vibration Absorber, Analysis, Gyroscopic Vibration absorbers, analysis & experimental set up and observations, Active Vibration absorbers. Control of Structures: Introduction, Structures as control plants, Modelling structures for control, Control strategies and Limitations. Biomimetics: Characteristics of Natural structures. Fibre reinforced: organic matrix natural composites, Natural creamers, Mollusks. Biomimetic sensing, Challenges and oppurtunities.

MODULE 4

MEMS: History of MEMS, Intrinsic Characteristics, Devices: Sensors and Actuators. Microfabrication: Photolithography, Thermal oxidation, Thin film deposition, etching types, Doping, Dicing, Bonding. Microelectronics fabrication process flow, Silicon based, Process selection and design. Piezoelectric Sensing and Actuation: Introduction, Cantilever Piezoelectric actuator model, Properties of Piezoelectric materials, Applications. Magnetic Actuation: Concepts and Principles, Magnetization and Nomenclatures, Fabrication and case studies, Comparison of major sensing and actuation methods.

MODULE-5

Polymer MEMS & Micro fluidics: Introduction, Polymers in MEMS (Polyimide, SU8,LCP,PDMS,PMMA,Parylene,Others)Applications(Acceleration, Pressure, Flow, Tactile sensors). Motivation for micro fluidics, Biological Concepts, Design and Fabrication of Selective components. Channels and Valves. Case Studies: MEMS Magnetic actuators, BP sensors, Microphone, Acceleration sensors, Gyro, MEMS Product development: Performance, Accuracy, Repeatability, Reliability, Managing cost, Market uncertainties, Investment and competition .

TEXT BOOKS:

1. “Smart Structures –Analysis and Design”, A.V.Srinivasan, Cambridge University Press, New York, 2001, (ISBN:0521650267).

2. “Smart Materials and Structures”, M.V.Gandhi and B.S.Thompson Chapmen & Hall, London, 1992 (ISBN:0412370107)

3. “Foundation of MEMS, by Chang Liu. Pearson Education. (ISBN:9788131764756)

REFERENCES:

1. Duerig,T. W., Melton, K. N, Stockel, D. and Wayman, C.M., “Engineering aspects of Shapememory Alloys”, Butterworth – Heinemann, 1990.
2. Rogers, C. A., Smart Materials, “Structures and Mathematical issues”, Technomic Publishing Co., U.S.A, 1989.
3. Mel Schwartz (Ed), Encyclopaedia of Smart Materials” Volume –I and II, John Wiley & Sons, Inc.2002
4. Presswww.ethics.org , 2004.

MODELING AND SIMULATION LABORATORY

[AS PER CHOICE BASED CREDIT SYSTEM (CBCS) SCHEME]

Subject Code	:	15MAL76	IA Marks	:	20
No. of Lecture Hrs./ Week	:	01	Exam Hours	:	03
No. of Practical Hrs./ Week	:	02	Exam Marks	:	80

PART-A

1. Stress analysis of a plate with circular hole
2. Stress analysis of rectangular L bracket
3. Stress analysis of beam
4. Mode frequency analysis of beam
5. Harmonic analysis of a 2D component
6. Stress analysis of an axi – symmetric component
7. Thermal stress analysis of a 2D component
8. Conductive heat transfer analysis of a 2D component
9. Convective heat transfer analysis of a 2D component

PART-B

1. Introduction to MAT LAB
2. Simulation of spring-mass system using MAT LAB
3. Simulation of cam and follower mechanism using MAT LAB

Suggested Packages:

1. ANSYS, NISA, NASTRAN, MAT LAB

Scheme for Examination:
One Question from Part A - 32 Marks (08 Write up +24)
One Question from Part B - 32 Marks (08 Write up +24)
Viva-Voce - 16 Marks
Total 80 Marks

HYDRAULIC CIRCUITS AND PROGRAM LOGIC CONTROLLERS LABORATORY

[AS PER CHOICE BASED CREDIT SYSTEM (CBCS) SCHEME]

Subject Code	:	15MAL77	IA Marks	:	20
No. of Lecture Hrs./ Week	:	01	Exam Hours	:	03
No. of Practical Hrs./ Week	:	02	Exam Marks	:	80

PART – A

1. Meter-in and Meter-out concepts in designing of Hydraulic Circuits using Single-rod cylinder& 4/2 DCV/ Manual lever operated valve.

2. Application of 4/3 position tandem centre configuration, DCV/Manually operated Valve to demonstrate application in forklifts.

3. Opreaion of Hydraulic motor using 4/3 way valve.

4. Application of Hydraulic accumulator as stand by hydraulic energy source during power failures.

5. Design a circuit and conduct experiment to press a work piece in a fixture by means of a hydraulic cylinder. After the pressing pressure was reached, the hydraulic cylinder is to retract automatically

PART-B

LOGIC GATES

1. To draw the ladder program for various logic gates using STEP 7 software and to verify the correctness of the same using the PLC.

DEMORGAN LAW

2. To draw the ladder diagrams for De Morgan's laws and to verify the truth tables of the same using the PLC.

ARITHMETIC OPERATIONS

3. To draw and verify the ladder diagram for arithmetic operations using the PLC.

TWO MOTOR SYSTEM (USE OF OFF DELAY TIMER)

4. To draw and verify the ladder diagram for the given problem using the PLC.

TWO MOTOR SYSTEM (USE OF ON DELAY TIMER)

5. To draw and verify the ladder diagram for the given problem using the PLC.

SELECTION COMMITTEE

6. To draw and verify the ladder diagram for the given problem using the PLC.

RAILWAY PLATFORM SIGNALLING

7. To draw and verify the ladder diagram for the given problem using the PLC.

Scheme for Examination:
One Question from Part A - 32 Marks (08 Write up +24)
One Question from Part B - 32 Marks (08 Write up +24)
Viva-Voce - 16 Marks
Total 80 Marks

PROJECT WORK, PHASE-I SEMINAR

Course	code	credits	L-T-P	Assessment		Exam Duration
				SEE	CIA	
Project Work, Phase I Seminar	15MAP78	2	0-0-0	100	100	----

TOTAL QUALITY MANAGEMENT

[AS PER CHOICE BASED CREDIT SYSTEM (CBCS) SCHEME]

Subject Code	:	15MA81	IA Marks	:	20
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	50	Exam Marks	:	80

Module - 1

Principles and Practice: Definition, basic approach, gurus of TQM, TQM Framework, awareness, defining quality, historical review, obstacles, benefits of TQM. Quality Management Systems: Introduction, benefits of ISO registration, ISO 9000 series of standards, ISO 9001 requirements. **10 Hours**

Module - 2

Leadership: Definition, characteristics of quality leaders, leadership concept, characteristics of effective people, ethics, the Deming philosophy, role of TQM leaders, implementation, core values, concepts and framework, strategic planning communication, decision making, **10 Hours**

Module - 3

Customer Satisfaction and Customer Involvement: Customer Satisfaction: customer and customer perception of quality, feedback, using customer complaints, service quality, translating needs into requirements, customer retention, case studies.

Employee Involvement – Motivation, employee surveys, empowerment, teams, suggestion system, recognition and reward, gain sharing, performance appraisal, unions and employee involvement, case studies. **10 Hours**

Module - 4

Continuous Process Improvement: process, the Juran trilogy, improvement strategies, types of problems, the PDSA Cycle, problem-solving methods, Kaizen, reengineering, six sigma, case studies.

Statistical Process Control : Pareto diagram, process flow diagram, cause and effect diagram, check sheets, histograms, statistical fundamentals, Control charts, state of control, out of control process, control charts for variables, control charts for attributes, scatter diagrams, case studies **10 Hours**

Module - 5

Tools and Techniques: Benching marking, information technology, quality management systems, environmental management system, and quality function deployment, quality by design, failure mode and effect analysis, product liability, total productive maintenance.

10 Hours

TEXT BOOKS:

1. Total Quality Management: Dale H. Besterfield, Publisher -Pearson Education India, ISBN: 8129702606, Edition 03.

2. Total Quality Management for Engineers: M. Zairi, ISBN:1855730243, Publisher: Wood head Publishing

REFERENCE BOOKS:

1. Managing for Quality and Performance Excellence by James R.Evans and Williuam M Lindsay, 9th edition, Publisher Cengage Learning.
2. A New American TQM, four revolutions in management, Shoji Shiba, Alan Graham, David Walden, Productivity press, Oregon, 1990
3. Organizational Excellence through TQM, H. Lal, New age Publications, 2008

Scheme of Examination: Two question to be set from each module. Students have to answer five full questions, choosing at least one full question from each module.

INDUSTRIAL ROBOTICS

[AS PER CHOICE BASED CREDIT SYSTEM (CBCS) SCHEME]

Subject Code	:	15MA82	IA Marks	:	20
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	50	Exam Marks	:	80

MODULE – 1

Automation in Manufacturing: Introduction: Automation and robotics, brief history of robotics, social and economic aspects of robots, advantages of using robots, advantages and disadvantages of using robots in industries. Overview of robots-present and future applications. Classification and Structure of Robotic System: Classifications, geometrical configuration, wrist and its motions and effectors and its types, links and joints. Robot drive system: Hydraulic, electric and pneumatic drive system, resolution, accuracy and repeatability, advantages and disadvantages of drive systems. **10 Hours**

MODULE - 2

Control System and Components: Basic control system concepts and models, transformation and block diagram of spring mass system, controllers-ON and OFF, promotional integral proportional and integral transient and response to second order system. Robot Programming: Introduction, Manual teaching, lead through teaching, programming languages, programming with graphics, storing and operating. Task programs. **10 Hours**

MODULE - 3

Robot Motion Analysis: Kinematics-Introduction, direct and inverse kinematics, rotation matrix, composite rotation matrix, rotation matrix about an arbitrary axis, Euler angles representation, homogeneous transformations, links, joints and their parameters, D-H representations. Geometrical approach to direct and inverse kinematics. **10 Hours**

MODULE - 4

Robot Arm Dynamics: La Grange Euler formulations-joint velocities, kinetic energy potential energy and motion equations of robot manipulator.

Trajectory Planning: Introduction, general considerations on trajectory planning, joint interpolated trajectories, 4-3-4-trajectory example. **10 Hours**

MODULE - 5

Sensors: State and external state sensors, tactile sensors, non-tactile sensors, proximity sensing, range sensing, and force-torque sensors. Elements of computer vision, sensing and digitizing function in machine vision-image device-lighting techniques-analog to digital signal convention-sampling-quantitization – encoding - image – storage, Image processing and analysis. **10 Hours**

TEXT BOOKS:

1. **Industrial Robotics** - Groover, PHI, New Delhi
2. **Robotics -** Yorem Korem, McGraw Hill Intl. Book Co., New Delhi

REFERENCE BOOKS:

1. **Robot Manipulators, Mathematics, programming and control -**Richard paul.,
2. **Robotics -** Fu. Gonzales and LeeMcGraw Hill.
3. **Fundamentals of Robotics -** Robert J. Schiling
4. **Robotic Engineering -** Richard D Klafer,", PHI

PROFESSIONAL ELECTIVE – V

NON DESTRUCTIVE TESTING

[AS PER CHOICE BASED CREDIT SYSTEM (CBCS) SCHEME]

Subject Code	:	15MA831	IA Marks	:	20
No. of Lecture Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Lecture Hrs.	:	50	Exam Marks	:	80

MODULE 1

NON-DESTRUCTIVE TESTING: AN INTRODUCTION

Introduction to various non-destructive methods- Comparison of Destructive and Non destructive Tests, Need for Non-destructive testing, merits, limitations and applications. Visual Inspection, Optical aids used for visual inspection, Comparison and selection of various NDT techniques **10 Hours**

MODULE 2

LIQUID PENETRANT TESTING AND MAGNETIC PARTICLE TESTING

Physical principles, procedure for penetrant testing, Penetrant testing materials, Penetrant testing methods – Applications Principle of MPT, Magnetising technical and procedure used for testing a component , Equipment used for MPT , Applications. **10 Hours**

MODULE 3

EDDY CURRENT TESTING AND ACOUSTIC EMISSION TESTING

Principles, Instrumentation for ECT, Various Techniques – High sensitivity Techniques, Single, Multi and high frequency ECT, Applications. Principle of AET,AE signal parameters, Applications. **10 Hours**

MODULE 4

ULTRASONIC TESTING

Principle, Ultrasonic transducers, Inspection Methods – Normal Incident Pulse echo Inspection, Through – transmission Testing, angle Beam Pulse-echo testing, Techniques for

Normal Beam Inspection, Ultrasonic Flaw detection Equipment, Modes of display – A-Scan, B-Scan & C- Scan- Applications. **10 Hours**

MODULE 5

RADIOGRAPHY & HOLOGRAPHY

Basic principle, Effect of radiation on Film, Radiographic imaging – Inspection Techniques – Single wall single image, Double wall Penetration & Multiwall Penetration technique – Basic Principles of holography, Instrumentation, Applications of holographic techniques– advantages and limitations. **10 Hours**

TEXT BOOKS:

1. Baldev raj, T Jeyakumar, M. Thavasimuthu “Practical Non Destructive Testing” Narosa publishing house, New Delhi, 2002.

REFERENCES:

1. Krautkramer. J., “Ultra Sonic Testing of Materials”, 1st Edition, Springer – Verlag Publication, New York, 1996.
2. Peter J. Shull “Non Destructive Evaluation: Theory, Techniques and Application” Marcel Dekker, Inc., New York, 2002 www.ndt.net
3. Baldev Raj and B.Venkataraman, “Practical Radiology”, Narosa Publishing House, 2004
4. Birchan.B, “Non-Destructive Testing”, Oxford, London, 1975

PRODUCT LIFE CYCLE MANAGEMENT

[AS PER CHOICE BASED CREDIT SYSTEM (CBCS) SCHEME]

Subject Code	:	15MA832	IA Marks	:	20
No. of Lecture Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Lecture Hrs.	:	50	Exam Marks	:	80

MODULE 1

Introduction to Product Life Cycle Management (PLM) : Definition, PLM Lifecycle model, Threads of PLM, Need for PLM, Opportunities and benefits of PLM, Views, Components and Phases of PLM, PLM feasibility study, PLM visioning.

PLM Concepts, Processes and Workflow: Characteristics of PLM, Environment driving PLM,PLM Elements, Drivers of PLM, Conceptualization, Design, Development, Validation, Production, Support of PLM. **10 Hours**

MODULE 2

Product Data Management (PDM) Process and Workflow: PDM systems and importance, reason for implementing a PDM system, financial justification of PDM implementation. Versioning, check-in and checkout, views, Metadata, Lifecycle, and workflow.

10 Hours

MODULE 3

Collaborative Product Development: Engineering vaulting, product reuse, smart parts, engineering change management, Bill of materials and process consistency, Digital mock-up and prototype development, design for Environment, virtual testing and validation, marketing collateral.

Tools of Communication for collaborative work: Creation of 3DXML and CAD drawing using CAD software. Creation of an animation for assembly instructions on 3D via composer, creation of an acrobat 3D document. **10 Hours**

MODULE 4

Knowledge and optimization of design products: Know how, best practices, parameterization of design, Applied problems and Solution on optimization of products using

power copy, publication, parameters, formula, rule, check, design table, configuration, reaction. **10 Hours**

MODULE 5

Digital Manufacturing – PLM: Digital manufacturing, benefits manufacturing, manufacturing the first-one, Ramp up, virtual learning curve, manufacturing the rest, production planning.

Developing a PLM strategy and conducting a PLM assessment: Strategy, Impact of strategy, implementing a PLM strategy, PLM initiatives to support corporate objectives. Infrastructure assessment, assessment of current systems and applications**.** **10 Hours**

TEXT BOOK

1. Product Lifecycle Management : Grieves, Michael, McGraw-Hil,Edition 2006.ISBN 0071452303
2. PDM: Product Data Management: Burden, Rodger, Resource Pub, 2003. ISBN 0970035225.

REFERENCES

1. Fabio Guidice, Guido La Rosa, Product Design for the environment-A life cycle approach, Taylor and Francis 2006.

2. Robert J. Thomas, “NDP: Managing and forecasting for strategic processes”.

3. Hartman, “Product life cycle management with SAP”, 2006

4. Stark, John,”Product Life cycle Management: Paradigm for 21st Century Product Realization “, Springer-Verlag, 2004. ISBN 1852338105

MANAGEMENT INFORMATION SYSTEM

[AS PER CHOICE BASED CREDIT SYSTEM (CBCS) SCHEME]

Subject Code	:	15MA833	IA Marks	:	20
No. of Lecture Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Lecture Hrs.	:	50	Exam Marks	:	80

MODULE 1

FOUNDATION CONCEPTS: Foundations of Information Systems in Business- Information Systems and Technologies, Business applications, Developments, and Management, Competing with Information Technology – Fundamental of Strategic Advantage, Using Information Technology for Strategic Advantage**.** **8 Hours**

MODULE 2

REVIEW OF INFORMATION TECHNOLOGIES: Computer Hardware – Computer Systems, End use and Enterprise Computing, Computer Peripherals, Input, output, and Storage Technologies, Computer Software – Application Software, End user application, SystemSoftware.

REVIEW OF INFORMATION TECHNOLOGIES: Computer System Management, Data Resource Management – Managing Data Resources, Technical Foundations of Database Management, Telecommunications and Networks – Overview of Telecommunications and Networks, Technical Telecommunications alternatives. **12 Hours**

MODULE 3

BUSINESS APPLICATIONS: Enterprise Communication and Collaboration, Electronic Business Systems – Cross-Functional E-Business systems, Functional E-Business Systems, Electronic Commerce Systems – Electronic Commerce Fundamentals.

BUSINESS APPLICATIONS: Commerce Applications and Issues, E-Business Decision Support – Decision Support in E- Business, Artificial Intelligence Technologies in Business. **10 Hours**

MODULE 4

BUSINESS APPLICATIONS: The internet worked E-business Enterprise – The Internet, Intranets and Extranets in Business

DEVELOPMENT PROCESS: Developing E- Business Strategies – E – Business Planning Fundamental, Implementing E- Business Strategies, Developing E- Business Solutions – Developing Systems, Implementing E- Business systems**.** **12 Hours**

MODULE 5

MANAGEMENT CHALLENGES: Security and Ethical Challenges of E-Business – Security, Ethical and Societal Challenges of E-Business, Security Management of E-Business, Enterprise and Global Management of E-business Technology – Managing E-Business Technologies, Global E- business Technology Management. **8 Hours**

TEXT BOOKS:

1. **Management Information systems**- managing information technology in the internet worked enterprise- jams. A O'Brien – Tata McGraw Hill publishing company limited 2002 5th Edition ISB 0-07-048637-9
2. **Management information system** - W.S. Jawadekar TMH 1998 edn ISBN -0-07-463197-7

REFERENCE BOOKS:

1. **Management Information Systems**-Laaudon & Ludon PHI ISBN 81-203-1282-1.1990 edn.,
2. **Management Information systems**- S. Sadogopan. PHI 1998Edn. ISBN 81-203-1180-9
3. **Information systems for modern management** - G.R. Murdick PHI

FLEXIBLE MANUFACTURING SYSTEMS

[AS PER CHOICE BASED CREDIT SYSTEM (CBCS) SCHEME]

Subject Code	:	15MA834	IA Marks	:	20
No. of Lecture Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Lecture Hrs.	:	50	Exam Marks	:	80

MODULE 1

PLANNING, SCHEDULING AND CONTROL OF FLEXIBLE MANUFACTURING SYSTEMS

Introduction to FMS– development of manufacturing systems – benefits – major elements – types of flexibility – FMS application and flexibility –single product, single batch, n – batch scheduling problem – knowledge based scheduling system. **10 Hours**

MODULE 2

COMPUTER CONTROL AND SOFTWARE FOR FLEXIBLE MANUFACTURING SYSTEMS

Introduction – composition of FMS– hierarchy of computer control –computer control of work center and assembly lines – FMS supervisory computer control – types of software specification and selection – trends. **10 Hours**

MODULE 3

FMS SIMULATION AND DATA BASE

Application of simulation – model of FMS– simulation software – limitation – manufacturing data systems – data flow – FMS database systems – planning for FMS database. **10 Hours**

MODULE 4

GROUP TECHNOLOGY AND JUSTIFICATION OF FMS

Introduction – matrix formulation – mathematical programming formulation –graph formulation – knowledge based system for group technology – economic justification of FMS- application of possibility distributions in FMS systems justification. **10 Hours**

MODULE 5

APPLICATIONS OF FMS AND FACTORY OF THE FUTURE

FMS application in machining, sheet metal fabrication, prismatic component production – aerospace application – FMS development towards factories of the future – artificial intelligence and expert systems in FMS – design philosophy and characteristics for future.

10 Hours

TEXT BOOKS

1. Jha, N.K. “Handbook of flexible manufacturing systems”, Academic Press Inc., 1991.

REFERENCES:

1. Radhakrishnan P. and Subramanyan S., “CAD/CAM/CIM”, Wiley Eastern Ltd., New Age International Ltd., 1994.
2. Raouf, A. and Ben-Daya, M., Editors, “Flexible manufacturing systems: recent development”, Elsevier Science, 1995.
3. Groover M.P., “Automation, Production Systems and Computer Integrated Manufacturing”, Prentice Hall of India Pvt., New Delhi, 1996.
4. Kalpakjian, “Manufacturing Engineering and Technology”, Addison-Wesley Publishsing Co., 1995.
5. Taiichi Ohno, “Toyota Production System: Beyond large-scale Production”, Productivity Press (India) Pvt. Ltd. 1992.

INTERNSHIP/ PROFESSIONAL PRACTICE

Course	code	credits	L-T-P	Assessment		Exam Duration
				SEE	CIA	
Internship/ Professional Practice	15MA84	2	Industry Oriented	50	50	3 Hrs

PROJECT WORK, PHASE II

Course	code	credits	L-T-P	Assessment		Exam Duration
				SEE	CIA	
Project Work, Phase II	15MAP85	6	0-6-0	100	100	3 Hrs

SEMINAR

Course	code	credits	L-T-P	Assessment		Exam Duration
				SEE	CIA	
Seminar	15MAS86	4	0-4-0	100		-