GOVERNMENT COLLEGE OF ENGINEERING, AURANGABAD

(An Autonomous Institute of Government of Maharashtra)

Department of Mechanical Engineering

Teaching and Evaluation Scheme (**w.e.f 2014-15)**

ME (Full-Time) in Production

Course Code	Name of Subject	Scheme of Teaching (Hrs/Week)				Scheme of Evaluation (Marks)					
						Theory					
		L	T	P	Total Credits	Test	TA	End sem	Term Work	Practical/ Viva-voce	Total
SEMESTER I											
ME576	Advanced Manufacturing Techniques	4	-	-	4	20	20	60	-	-	100
ME577	Advanced Mathematical Methods	4	-	-	4	20	20	60	-	-	100
ME578	Modern Management Systems	4	-	-	4	20	20	60	-	-	100
	Elective–I (**ME579** to **ME581**)	4	-	-	4	20	20	60	-	-	100
	Elective–II (**ME582** to **ME584**)	4	-	-	4	20	20	60	-	-	100
ME585	Lab – I	-	-	2	2	-	-	-	50	-	50
ME586	Seminar – I	-	-	2	2	-	-	-	25	25	50
	Total of Semester - I	**20**	-	**4**	**24**	**100**	**100**	**300**	**75**	**25**	**600**
	Total Credit Points				**24**						
SEMESTER II											
ME587	Computer Integrated Manufacturing	4	-	-	4	20	20	60	-	-	100
ME588	Production Management	4	-	-	4	20	20	60	-	-	100
ME589	Collaborative Engineering	4	-	-	4	20	20	60	-	-	100
	Elective–III (**ME590** to **ME592**)	4	-	-	4	20	20	60	-	-	100
	Elective – IV (**ME593** to **ME595**)	4	-	-	4	20	20	60	-	-	100
ME596	Lab - II	-	-	2	2	-	-	-	50	-	50
ME597	Seminar – II	-	-	2	2	-	-	-	25	25	50
	Total of Semester - II	**20**	-	**4**	**24**	**100**	**100**	**300**	**75**	**25**	**600**
	Total Credit Points				**24**						
SEMESTER III											
GE 611 **ET 561** **CS 559** **CS 560** **EE 572** **EE 675** **AM 641**	Institute Elective	4	-	-	4	20	20	60	-	-	100
GE 612	Environmental Studies	3			3	20	20	60			100
ME611	Dissertation Part - I	-	-	10	10	-	-	-	50	50	100
	Total of Semester - III	**4**	-	**10**	**17**	**20**	**20**	**20**	**50**	**50**	**300**
	Total Credit Points				**17**						
SEMESTER IV											
ME 612	Dissertation Part – II	-	-	10	14	-	-	-	50	150	200
	Total of Semester – IV	**-**	**-**	**10**	**14**	-	-	-	**50**	**50**	**200**
	Total Credit Points				**14**						
	GRAND TOTAL										**1700**

Elective – I

ME579 Modern Engineering Materials
ME580 Advance Operations Research
ME581 Materials and Logistics Management

Elective – II

ME582 Robotics and Automation
ME583 Engineering Experimental Techniques
ME584 Management Information System and Enterprise Resource Planning

Elective – III

ME590 Machine Tool Design
ME591 Computer Aided Optimization
ME592 Engineering Economics

Elective – IV

ME593 Reliability Engineering
ME594 Flexible Manufacturing System
ME595 Facilities Planning and Material Handling System

Institute Elective

ET 561 Soft Computing
CS559 Professional Ethics & Cyber Law
CS560 Web Technologies
EE572 Renewable Energy Technology
EE675 Renewable Energy Technology
GE611 Research Methodology
AM 641 Finite element methods for engineers

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GOVERNMENT COLLEGE OF ENGINEERING, AURANGABAD

(An Autonomous Institute of Government of Maharashtra)

Department of Mechanical Engineering

Teaching and Evaluation Scheme (**w.e.f 2014-15)**

ME (Part-Time) in Production

Course Code	Name of Subject	Scheme of Teaching (Hrs/Week)				Scheme of Evaluation (Marks)					
						Theory			Term Work	Practical/ Viva-voce	Total
		L	T	P	Total Credits	Test	TA	End sem			
SEMESTER I											
ME576	Advanced Manufacturing Techniques	4	-	-	4	20	20	60	-	-	100
ME577	Advanced Mathematical Methods	4	-	-	4	20	20	60	-	-	100
ME578	Modern Management Systems	4	-	-	4	20	20	60	-	-	100
	Total of Semester - I	**12**	**-**	**-**	**12**	**60**	**60**	**180**	**-**	**-**	**300**
	Total Credit Points				**12**						
SEMESTER II											
	Elective–I (**ME579** to **ME581**)	4	-	-	4	20	20	60	-	-	100
	Elective–II (**ME582** to **ME584**)	4	-	-	4	20	20	60	-	-	100
ME585	Lab – I	-	-	2	2	-	-	-	50	-	50
ME586	Seminar – I	-	-	2	2	-	-	-	25	25	50
	Total of Semester - II	**8**	**-**	**4**	**12**	**40**	**40**	**120**	**75**	**25**	**300**
	Total Credit Points				**12**						
SEMESTER III											
ME587	Computer Integrated Manufacturing	4	-	-	4	20	20	60	-	-	100
ME588	Production Management	4	-	-	4	20	20	60	-	-	100
ME589	Collaborative Engineering	4	-	-	4	20	20	60	-	-	100
	Total of Semester - III	**12**	**-**	**-**	**12**	**60**	**60**	**180**	**-**	**-**	**300**
	Total Credit Points				**12**						
SEMESTER IV											
	Elective–III (**ME590** to **ME592**)	4	-	-	4	20	20	60	-	-	100
	Elective – IV (**ME593** to **ME595**)	4	-	-	4	20	20	60	-	-	100
ME596	Lab - II	-	-	2	2	-	-	-	50	-	50
ME597	Seminar – II	-	-	2	2	-	-	-	25	25	50
	Total of Semester - IV	**8**	**-**	**4**	**12**	**40**	**40**	**120**	**50**	**50**	**300**
	Total Credit Points				**12**						
SEMESTER V											
GE 611 ET 561 CS 559 CS 560 EE 572 EE 675 AM 641	Institute Elective	4	-	-	4	20	20	60	-	-	100
GE 612	Environmental Studies	3	-	-	3	20	20	60			100
ME611	Dissertation Part - I	-	-	10	10	-	-	-	50	50	100
	Total of Semester - V	**4**	**-**	**10**	**17**	**20**	**20**	**20**	**50**	**50**	**300**
	Total Credit Points				**17**						
SEMESTER VI											
ME 612	Dissertation Part – II	-	-	10	14	-	-	-	50	150	200
	Total of Semester – VI	**-**	**-**	**10**	**14**	-	-	-	**50**	**50**	**200**
	Total Credit Points				**14**						
	GRAND TOTAL										**1700**

Elective – I

ME579 Modern Engineering Materials
ME580 Advance Operations Research
ME581 Materials and Logistics Management

Elective – II

ME582 Robotics and Automation
ME583 Engineering Experimental Techniques
ME584 Management Information System and Enterprise Resource Planning

Elective – III

ME590 Machine Tool Design
ME591 Computer Aided Optimization
ME592 Engineering Economics

Elective – IV

ME593 Reliability Engineering
ME594 Flexible Manufacturing System
ME595 Facilities Planning and Material Handling System

Institute Elective

ET 561 Soft Computing
CS559 Professional Ethics & Cyber Law
CS560 Web Technologies
EE572 Renewable Energy Technology
EE675 Renewable Energy Technology
GE611 Research Methodology
AM 641 Finite element methods for engineers

ME576: ADVANCED MANUFACTURING TECHNIQUES

Teaching Scheme
Lectures: 4 hrs/week

Examination Scheme
Class Test – 20 marks
Teacher's Assessment – 20 marks
End Sem Exam – 60 marks

Objectives:

Understand fundamental concepts rapid casting development, identify the use of Rapid prototype in various casting operations, Work out force Analysis professionally at tool chip interface in super finishing operations, Understand and analyze the advance chip less manufacturing process and its machine tools. Acquire knowledge of advance plastic product manufacturing process and metal coating process in view of their manufacturability, constraints and practical analysis.

Outcomes:

Recognize and apply the fundamental concepts rapid casting development in practice, Apply the knowledge in critical patterns developments, Improve analytical ability in various super finishing operations by problem solving and professional practice, Apply knowledge of advance chip less manufacturing process to design and develop new product, Enhance and develop professional skill of metal coating to improve life of product. Design and develop various new products by using advance plastic product manufacturing techniques

Advances in Casting Process: Rapid Casting Development, Design for Casting: Manufacturability 'health-checks'; guidelines for improving the casting design; web-based collaboration, Rapid Tooling Development: Rapid prototype patterns; rapid tooling methods; benchmarking of RP&T routes for casting application, Casting Process Planning: Process selection; selection of steps and process parameters; casting cost estimation. Sheet moulding casting V process, flask less moulding, evaporative casting, plaster mould casting, design for plaster mould casting, quality, accuracy, uniformity in casting and moulding.

Manufacturing by Machining: Analysis of tool-chip interface - Geometry and models of tool wear, tool-life and tool-temperature, tool-chip interface friction, tool condition monitoring, importance.

Chip less Metal Removal Processes: Non-traditional manufacturing processes, Abrasive jet machining, Water jet machining, Magneto abrasive finishing, wire EDM, Micro drilling by different processes like laser beam, ion beam, electro jet, electro stream drilling, nontraditional deburring processes.

Plastic Manufacturing Processes: Compression molding, Transfer molding, Injection molding, Extrusion cold molding, Thermo forming, Blow molding, Roto molding, Structured form molding.

Metallic Coating: Importance, Principle application of - Chemical vapor deposition, Physical vapor deposition, Thermal spray coating, Electroplating, Electroless Coating.

Reference Books

1. Benjamin W., Niebel A., "Modern Manufacturing Process Engineering", Tata-McGraw Hill publications.
2. Bendict G. F., Dekker, "Nontraditional Manufacturing Processes", Marcel Inc. New York.
3. HMT, "Production Technology Hand Book", Tata-McGraw Hill publications.
4. Ravi B., "Metal Casting: Computer-Aided Design and Analysis", Prentice-Hall of India, 2005.
5. Weller E. J., "Non-Traditional Machining Process", Society of Manufacturing Engineers, Dearban Michigan.
6. Amsteal, Philip, Begman, "Manufacturing Processes", John Willey and Sons, 8th edition.
7. Mishra P. K., "Non-traditional Machining Processes", Narosa publications.
8. Heine R.W., Loper C.R., Rosenthal P.C., " Principles of Metal Casting", and Tata McGraw Hill, New Delhi, 1991.

9. Mukherjee P.C., "Metal Casting Technology", Oxford and IBH, 1979.
10. Ghosh A., Mallik A. K., "Manufacturing Science", East-West Press, 1985.

ME577: ADVANCED MATHEMATICAL METHODS

Teaching Scheme
Lectures: 4 hrs/week

Examination Scheme
Class Test – 20 marks
Teacher's Assessment – 20 marks
End Sem Exam – 60 marks

Objectives:

We help the students to master their skills and improve their mathematical ability and maturity. The main objective of this course is to provide the student with a repertoire of mathematical methods that are essential to the solution of advanced problems encountered in the fields of engineering. In addition, this course is intended to prepare the student with mathematical tools and techniques that are required in advanced courses offered in the engineering programs.

Outcomes:

Application of the basic science systematization thought excavation, evaluation, diagnosis project question, and plans and carries out ability of the special study and the solution. Have independent research, collection of the data, standard problem development, acquire conclusion from data, and have development innovation and compose the ability of professional thesis. Use mathematics in engineering realm to do design and analysis, explanation of data obtained from experiments with independently ability to solve the problem.

Numerical Methods to Solve Partial Differential Equations, Hyperbolic equations, parabolic equations, Elliptic equations, solution of laplace equations, solution of poission's equations, solution of elliptic equations by relaxation method, solution of one dimensional heat flow equation, solution of two dimensional heat flow equation, solution of wave equation.

Matrices: Matrix inversion, Gauss elimination method, Gauss Jordan method, Crout's triangularisation method, Partition method, Iterative method, Homogeneous systems the eigen-value problem, the power method, Jacobi's method, eigen-values of symmetric matrices, transformation method, transformation of generalized eigen-value problem to standard.

Solution of Algebraic and Transcendental Equations: Basic properties of equations, Bisection method, False Position method, Secant method, Iteration method, Aitken's Δ^2 method, Newton Raphson method, Horner's method, Muller's method, Root squaring method and Comparison of iterative method.

Curve Fitting: Least square curve fitting procedures for straight line, Nonlinear curve fitting, weighted least square approximation, Method of least square for continuous function.

Finite Difference Methods: Formation of difference equation, linear difference equation, rules for finding out complementary function, rules for finding out particular integral, difference equations reducible to linear form, simultaneous difference equation with constant coefficients, application to deflection of a loaded string, loaded simply supported beams or cantilevers.

Reference Books

1. Kreyszig Erwin, "Advanced Engineering Mathematics",
2. Mathews John. H., "Numerical Methods", PHI, New Delhi.
3. Rajasekaran S., " Numerical Methods in Science and Engineering", Wheeler Publications
4. Grewal B. S., " Numerical Methods", Khanna Publication, New Delhi
5. Shastry S. S., "Introductory Methods of Numerical Analysis", PHI, New Delhi.
6. Chapra, Canal, "Numerical Methods for Engineers",

ME578: MODERN MANAGEMENT SYSTEMS

Teaching Scheme
Lectures: 4 hrs/week

Examination Scheme
Class Test – 20 marks
Teacher's Assessment – 20 marks
End Sem Exam – 60 marks

Objectives:

(1) Analysis of quality manufacturing techniques for improving productivity and profitability.
(2) Analyze maintenance problems and its effective implementation.
(3) Use of concurrent engineering in process improvement.
(4) Use of computational techniques for quantifying production management.

Outcomes:

(1) Ensuring organisational goals and targets are met with least cost and minimum waste.
(2) Looking after health and welfare and safety of staff and workforce.
(3) Protecting the machinery and resources and organisation including the human resources

Quality Management: Introduction to Quality management, principal of Quality management, Philosophies of various Quality Gurus, Quality planning, Quality circle, Human dimension in TQM, Quality Management Tools like Brainstorming, Histogram, check sheet, pareto diagram, Ishiwaka Diagram, control chart, scatter diagram, Affinity diagram, Tree diagram, Five S theory. Quality certification, Iso 9000,

Just In Time: Element of JIT manufacturing, Advantages, limitations, plant arrangement for flexible plan, planning, control, kanban, just in time logistics, Implementation issues in JIT manufacturing, Inventory management for JIT

Total Productive Maintenance: TPM-Definition and distinctive feature of TPM, Four developmental Stages of TPM Relationship between TPM, Terotechnology and logistics, Maximization equipment effectiveness organization for TPM implementation.

Concurrent Engineering: Concurrent Engineering-Principle, traditional verses concurrent approach, scheme and tools of concurrent engineering, application, of computers in practice of concurrent Engineering, Process Model type, Importance, relation between models, specification automation and process improvement, application of CE in design Engg, manufacturing Engg.

Computer assisted production management: Approaches to Computer assisted production management, Basic part representation method, shape, process economics, computer assisted QC, Co-ordinate measuring machine, construction, types, automated dimension gauging, and process gauging. Capacity planning, roll of capacity planning in manufacturing, planning and control system hierarchy of capacity planning decision links to other system modules Controls techniques.

Reference Books

(1) Juran TQM,TMH Publications.
(2) Introduction to TPM, Productivity Press(India).
(3) Chenge T.C., Just in time Manufacturing.
(4) Groover M.P, Automation Production System, Prentice Hall, USA.
(5) Bedwarth David, Computer Integrated Design and Manufacturing, Gray Sky Book.
(6) Juran J.M,Quality Planning and Anaysis-McGraw Hill,USA.
(7) Sud and Ingle,Quality Circle Master Guide, PHI Publications.
(8) Ross Phillip J,Taguchi Techniques for quality Engineering, McGraw Hill Publications.

ME579: MODERN ENGINEERING MATERIALS

Teaching Scheme
Lectures: 4 hrs/week

Examination Scheme
Class Test – 20 marks
Teacher's Assessment – 20 marks
End Sem Exam – 60 marks

Objectives:

(1) Understand and analyze the structure and properties of ferrous and non-ferrous materials and their heat treatment processes.
(2) Analyze the properties and applications of composite material for different applications.
(3) Understand the structure and application of organic materials.

Outcomes:

(1) Analyze and predict the heat treatment process for a particular ferrous and nonferrous material.
(2) Prediction and analysis of composite material for different applications.
(3) To be able to select a material for design and construction.

Ferrous Materials: Mechanical properties, heat treatments and applications; stainless steel and heat resisting steels, precipitation hardenable steels, valve steels, high strength low alloy steel (HSLA), micro alloyed steels, ball bearing steel, tool steels, high nitrogen steels, alloy cast iron.

Nonferrous Materials: Mechanical properties, heat treatments and applications; copper alloys (Brasses and Bronzes), Al –alloys (Al-Mg-Si, Al-Cu, Al-Si), designation system in Al – alloys.

Composites: Classifications, properties, application of composites, polymer matrix materials, metal matrix materials, ceramic matrix materials, carbon materials, glass materials, fiber reinforcements, types of fibers, whiskers, laminar composites, filled composites, particulate reinforced composites

Design of composites materials: Hybrid composites, angle plied composites, mechanism of composites, calculation of properties, unidirectional fiber composites, critical volume fraction, discontinuous fiber composites, rule of mixtures equation, critical angle. Analysis of an Orthotropic Lamina, strengths of orthotropic lamina, analysis of Laminated Composites, stress strain variations in laminates,

Organic Materials: Classification, properties, application of polymers, plastics and elastomers. Ceramics: Classification, properties, structures of refractories, abrasive materials, electronic ceramics, cement and concrete.

Reference Books

1 Jastrezebski Z.D., The nature and properties of engineering Materials, Wiley Newyork.
2 Aver S.H, Introduction to Physical Metallurgy, McGraw Hill,Tokyo.
2 Sharma S.C,Composite Material, Narosa Publishing House,New Delhi.
4 DeGarmo E.P.,Black J.T,Kosher R.A,Materials and processes in Manufacturing,Prentice Hall.
5 Rajput R.K.,Materials Science and Engineering,Kataria and sons.
6 Chawla K.K,Composite Materials,Springer.

ME580: ADVANCED OPERATIONS RESEARCH

Teaching Scheme
Lectures: 4 hrs/week

Examination Scheme
Class Test – 20 marks
Teacher's Assessment – 20 marks
End Sem Exam – 60 marks

Objectives:

To make the use of various operation research techniques like advanced linear programming, investment decisions, job sequencing and dynamic programming in solving and analyzing theoretical, industrial, research and real life problems

Outcomes:

Will be able to optimize solutions and its implementation by using advanced operation research techniques

Introduction: History, What is Operations Research, Where can OR be applied, what are OR techniques, Important steps in tackling OR problems effectively, general methods of deriving solution, limitations of OR.

Advanced Linear Programming: The techniques and its applications, definitions and mathematical formulation, problems formulations, graphical solution, simplex method, duality in LP, dual simplex method, sensitivity analysis in LP, degeneracy in LP, no feasible solution, unbounded solution.

Goal programming, revised simplex method, parametric programming, integer linear programming, Branch & bound algorithm, Gomory's cutting plane algorithm.

Investment Decision: Rationale and criteria, the concept of chain of equipments, cost volume profit analysis under uncertainty, risk adjusted discounted rate, risk analysis.

Replacement Analysis**:** Why to replace, replacement of items, which gradually deteriorate, sudden failure preventive replacement.

Job Sequencing: Introduction, common assumptions, sequencing of n jobs on 2 machines, algorithm for determining optimal sequence of n jobs on 2 machines, sequencing of n jobs on 3 machines, sequencing of n jobs on m machines, Gupta's algorithm for sequencing n jobs on m machines, Cambel, Dech and Smith's (CDS) algorithm, branch and bound method.

Dynamic Programming: Introduction, concept of dynamic programming, principle of optimality, stage coach problem, optimum route problem, allocation of salesman to territories, planning production of seasonal items, Markovian decision process, Toy makers problem, Taxi cab problem.

Reference Books

1. Taha H. A., "Operations Research an Introduction", Prentice Hall Inc. 2003.
2. Banerjee B., "Operations Research Techniques for Management", Business Book Publishing House.
3. Swarup Kanti, Gupta P. K., Man Mohan, " Operations Research", Sultan Chand and Sons Publishers.
4. Ravindran, "Operations Research"
5. Natarajan, Balasubramani, Tamilarasi, "Operations Research", Pearson Education, New Delhi, 1st Ed., 2005
6. Gupta P. K., Hira D. S., "Operations Research", S. Chand Publications, New Delhi.

ME581: MATERIALS AND LOGISTICS MANAGEMENT

Teaching Scheme
Lectures: 4 hrs/week

Examination Scheme
Class Test – 20 marks
Teacher's Assessment – 20 marks
End Sem Exam – 60 marks

Objectives:

1) Understand and analyze the material related functions, planning and decisions in the industry
2) Able to understand purchase policies and procurement of inventory and vendor development in the legal aspects of purchasing
3) To know the buying procedures, rate and running contract, stores procedures
4) To understand international buying procedures and licensing
5) To illustrate need of inventory, Genesis of logistics

Outcomes:

1) Enable to decide material policies and planning in industry
2) Able to execute purchase policies and procurement and vendor development
3) To implement buying procedures, running contract and store procedures
4) To analyze various inventory models and execute logistic decisions

Material Management: Concepts, objective and scope, organizing for materials function, various administrative practices.

Interaction with production and sales, material management planning and budgeting, various techniques, ABC analysis, standardization and codification, make and buy decision

Purchasing Scheme: Purchasing system, ordering, post purchase activity, price forecasting and analysis, purchasing under uncertainty vendor development and evaluation, purchase negotiation and pricing, purchasing of capital equipment tendering, purchase aerosol lease, import substitution, import regulations and procedure, legal aspects of purchasing.

Public Buying and Stores Management: Buying procedure related to various governmental organizations like DGS and D registration of suppliers, rate and running contracts, indenting procedure

Purchase of stores location and layout, various types of stores, stores procedures, stores accounting and stock checking management of scrap, obsolute, damage and unwanted stocks.

International Buying and Import Purchasing: Import procedures and documents, categories of import, basics of licensing, Import purchasing procedures, Registration of licenses at port

Logistics Management and Inventory: Genesis of logistics-logistics decision on facility location, need for inventory and its control, types of inventories, cost of inventory, determination of safety stock, EOQ, Q system or re-order point system, P system or replenishment system, S policy, store keeping and inventory control

Reference Books

1. Dobler Bunt, "Purchasing and Material Management", TMH Publications
2. Farrel, Heinritz, Smith,"Purchasing Principle and Application", Prentice Hall of India.
3. Gopalkrishnan and Sudershan, "Purchasing and Material Management", PHI Publications
4. Smolik, Nostrands, "Material Requirements and Manufacturing"
5. Ballou Ronald H., "Business Logistics Management", Prentice Hall of India.

ME582: ROBOTICS AND AUTOMATION

Teaching Scheme
Lectures: 4 hrs/week

Examination Scheme
Class Test – 20 marks
Teacher's Assessment – 20 marks
End Sem Exam – 60 marks

Objectives:

To understand robot anatomy and characteristic of different type, dynamic performance of robotic system and its kinematics. To know the different sensors, gripers their selection and dynamic performance analysis. To accustom with robot programming and its use in casting, welding, machining industry. To know the CNC, PLC and DC servo systems and machine interfacing.

Outcomes:

To develop ability of analyzing robot performance, Applying knowledge for sensor and gripper selection, preparing for programming of PLC's for various industrial systems.

Automation and Robotics: Definition, need of the Robotics, market and future prospects, differentiation of Robots from other automation systems, near relations to robots, robot usages and conditions for its application, Robot Anatomy and Characteristics: Classification, point to point and continuous path system, control loops of robot system, work volume, speed of movement, dynamic performance, Accuracy and repeatability, drive system, sensors used in robotics, letter symbol, coding and kinematics arrangement

Sensors and End Effectors in Robotics: Tactile sensors, proximity and rear sensors, force and torque sensors in Robotics, End effectors: Functions, Types, Design of linkage type end effectors, Vacuum gripper, Magnetic gripper, Special gripper, Engelberger's principles in selection and design of grippers

Robot Programming And Application: Robot Language, Development, Feature of different languages and introduction to robot language softwares, Introduction to artificial intelligence, Robot Cell Design: Function, Types, Man-Machine-Robot system, interlocking Methods of robot programming, Lead through programming methods, A robot program for generating a path space motion, Interpolation wait signal and delay commands, Robot Application: Various applications of Robot in foundry and precision casting, welding, spray coating, Manufacturing by Machining, Assembly and inspection.

CNC Systems And Robotics: Various configurations, CPU, PLC'S, Servo control units, speed position feedback, Other peripheral devices, Tool monitoring controls, Softwares, User interface, PLC programming/DC servo motors, Relays and solenoid stepper motor, Introduction and configuration of the CNC system, Interfacing Monitoring diagnostics, Machine Data, Compensations for machine accuracies, Programming direct numerical control.

Machine Interfacing: Interfacing electro mechanical system to microprocessor, PC and PLC's, Basic flow charts and programming for controlling machine tools and process parameters with the above systems, Study of various mechanical elements used in CNC: Robotics system viz-linear bearings, ball screws couplings.

Reference Books

1. Groover M. P., Willis, "Industrial Robotics", McGraw Hill.
2. Aures R. U. and Miller S. M., "Robotics applications and implications", Ballinger Publishing Co., Cambridge
3. Groover M. P. and Zimmer E. W., "Computer Aided Design and Manufacturing", Prentice Hall of India Ltd, New Delhi
4. "Machatronics", HMT Limited, Tata McGraw Hill Publications, New Delhi
5. David G., "Machatronics", Tata McGraw Hill Publications, New Delhi
6. Handbook of Industrial Robotics

ME583: ENGINEERING EXPERIMENTAL TECHNIQUES

Teaching Scheme
Lectures: 4 hrs/week

Examination Scheme
Class Test – 20 marks
Teacher's Assessment – 20 marks
End Sem Exam – 60 marks

Objectives:

To understand the concepts of calibrations, generalized measurement and experimental planning. To analyze the experimental data using various statistical techniques, writing reports. Measurement of parameters like force, torque, motion and vibration. Use of data acquisition system for processing the experimental data.

Outcomes:

Able to design, plan and execute experimental systems for particular engineering problems. Analyze and report performance of experimental systems.

Basic Concepts: Definition of terms, Calibration, Standards, Dimensions and units, the generalized measurement system, Basic concepts in dynamic measurements, system response, distortion, impedance matching, experimental planning.

Analysis of Experimental Data: Causes and types of experimental errors, uncertainty analysis, evaluation of uncertainties for complicated data reduction, Statistical analysis of experimental data, probability distributions, the Gaussian, normal error distribution, probability graph paper, the Chi-square test of Goodness of fit, The method of least squares, the correlation coefficient, standard deviation of the mean, *t*-distribution, Graphical analysis and curve fitting, general considerations in data analysis.

Force Torque and Strain Measurements: Mass balance measurements, elastic elements of force measurements, torque measurement, stress strain measurements, various types of strain gauges,

Motion and Vibration measurement: Simple vibration instruments, principles of the seismic instruments, practical considerations of seismic instruments, sound measurements.

Data Acquisition and Processing: The general data acquisition system, signal conditioning, data transmission, analog to digital and digital to analog conversions, data storage and display, the program as substitute for wired logic.

Reference Books

1. Holman J. P., "Experimental Methods for Engineers", 6th Ed, McGraw Hill Publications, New York.
2. Jain R. K., "Mechanical Measurements", Khanna Publishers, New Delhi.

ME584: MANAGEMENT INFORMATION SYSTEMS & ENTERPRISE RESOURCE PLANNING

Teaching Scheme
Lectures: 4 hrs/week

Examination Scheme
Class Test – 20 marks
Teacher's Assessment – 20 marks
End Sem Exam – 60 marks

Objectives:

(1) Understand the basic concept of Management Information System.
(2) Analyze the organizational framework for Management Information System.
(3) Analyze the Computational aspect of database management.
(4) Analysis of the decision support systems.
(5) Understanding and analysis of Recourse planning in an enterprise.

Outcomes:

(1) Analyzing the feasibility of application of MIS to organizations.
(2) Improvement in Organizational effectiveness with MIS.
(3) Effective utilization and analysis of organizational data.
(4) Improvement in cost benefit by effective decision making.
(5) Effective utilization of organizational recourses.

Introduction: Definition, Importance, Evolution, Computers & MIS organizational structures, Logical foundation, Future of MIS

Information Systems & Organization: Nature and characteristics of organizations. Organization and Information system structure, information. Data Information, Management & Information System. Information support for functional areas, impact of business on information systems, Organizing information systems, Acceptance of MIS in organization.

Computers & Database Technology: Evolution of computer hardware & soft wares, Database and enterprise management, file processing systems and database systems. Database approach and its architecture, DBMS, Models, RDBMS, SQL, 4GL, Data administration, Current development of databases.

Decision Support System: DSS issues, Structure, Construction-approaches. Generators, Tools, Software and cost benefits and simple examples of applications.

Enterprise Resource Planning: ERP basic features, Modules of ERP, ERP soft wares – comparative study, Implementation of ERP-preparation, Training needs.

Reference Books

1. Sadgopan S., "Management Information System", Prentice Hall of India, New Delhi 1997.
2. Davis Gordon B. and Olson M., "Management Information Systems", Mc Milan, New York.
3. Jawadekar W.S., "Management Information Systems", Tata McGraw-Hill, 2002
4. O'Brien, J. A. Jr., "Management Information Systems", Mc Milan, New York.
5. Date C. J., "An Introduction to Database Systems", 6th Edition, Addison Wesley, 1995.
6. Turban E. and Meredith J. R., "Fundamental of Management science", IRWIN Inc., 1991.
7. Murdick R. G. and Ross J. E., "Information Systems for Modern Management", PHI.

ME585: LABORATORY – I

Teaching Scheme
Tutorial: 2 hrs/week

Examination Scheme
Term Work – 50 marks

Objectives:

Acquiring knowledge of writing codes for solving problems

Outcomes:

Enhancing knowledge about writing codes for solving problems

The laboratory work will consist of development of codes for different numerical methods for learning purpose, chosen from those given in the contents of the Advanced Mathematical Methods syllabus.

Further, the lab hours shall be used for coding the algorithms developed for solution of any problem selected by student from the field of Production Engineering.

ME586: SEMINAR – I

Teaching Scheme
Tutorial: 2 hrs/week

Examination Scheme
Term Work – 25 Marks
Viva voce – 25 marks

Seminar – I should be based on literature survey on any topic, which will lead to dissertation in that area. It will be submitted as a report of about 25 pages of 'A4' size sheets in either comb or hard bound.

The candidate will have to deliver a seminar presentation in front of the examiners, one of them will be guide and other will be the examiner appointed by DSB. The performance of the student will be evaluated by both examiners jointly based on the content of the seminar, delivery of seminar and answers to the queries of the examiners.

ME587: COMPUTER INTEGRATED MANUFACTURING

Teaching Scheme
Lectures: 4 hrs/week

Examination Scheme
Class Test – 20 marks
Teacher's Assessment – 20 marks
End Sem Exam – 60 marks

Objectives:

Develop an understanding of classical production system, management technology. Develop an understanding of computer integrated manufacturing and its impact on productivity, product quality. Obtain an overview of computer technologies including computers, database and data collection networks, machine control etc

Outcomes:

Developed the ability of analyzing, Computer integrated manufacturing, Applying knowledge of database networking for manufacturing.

CIM and Communication: Networking, network components, types of cable media, local area network (LAN), wide area network (WAN), network topology, network standards and protocols (MAR/TOP etc), internet, carrier sense multiple access with collision detection (CSMA/CD) system, system security, trends and futures.

Integration Of Manufacturing: Integration of manufacturing activities and operations, CIM architecture, various models, CAD-CAM integration, CAPP, Automatic inspection systems, use of CMM, application of principals of Artificial Intelligence (AI) and expert systems to CAPP

DBMS in CIM: Data base management system in CIM, data acquisition, factory data collection system, data processing, data distribution, database file structure, organization and control, data structure models (hierarchical, network, relational and three schemes). Use of internet in manufacturing and business functions, E-commerce and future trends.

Economics Of CIM: Strategic benefits of CIM and accounting measures, evaluation of CIM systems, breakeven analysis, return on investment in the context of CIM, CIM feasibility analysis. socio-techno economic aspects of CIM.

Planning & Implementation Of CIM: Key aspects of planning and implementation, process management considerations. Various phases and steps in CIM implementation. Interfacing of computers to real life system such as machine tools, robots and other handling devices such as AGV, RGV and storage system AS/RS etc.

Reference Books

1. Teicholz Eric, Norr Joel,"CIM Handbook", McGraw Hill International.
2. Krieger, Harrington J., "Computer Integrated Manufacturing"
3. "An analysis of CAD/CAM application with introduction to CIM", Prentice Hall.
4. Bedworth David, "Computer Integrated Design and Manufacturing", McGraw Hill,
5. "CIM Interfaces by CIM Technology", Delmer Publication
6. Scholz B and Reiter, "CIM Interfaces", Chapman and Hall.

ME588: PRODUCTION MANAGEMENT

Teaching Scheme
Lectures: 4 hrs/week

Examination Scheme
Class Test – 20 marks
Teacher's Assessment – 20 marks
End Sem Exam – 60 marks

Objectives:

1. Able to understand production/Operation management objectives and various manufacturing strategies
2. Able to develop new product design concept and technology forecasting and development also able to design process
3. Analyze the capacity planning and strategies and various balancing methods
4. Carry out process flow analysis
5. To apply the concepts of supply chain management and forecasting techniques analysis

Outcomes:

1. Implementation of various manufacturing strategies and able to work out manufacturing excellence
2. Development of product design procedures and implementation of forecasting techniques and various design processes
3. To derive capacity strategies of various processes and its implementation
4. Enable to develop the use of various process flow charts and balancing methods
5. Implementation and execution of SCM concepts and forecasting techniques

Production Function: Definition of production/operation management, objectives, scope and functions, frame work of production management, manufacturing strategy and competitiveness, frame work of manufacturing strategy, operations effectiveness stage, manufacturing excellence, evolving-manufacturing perspectives like lean manufacturing, agile manufacturing, material and labour productivity.

Product and Process Design: Product Design: New product concept, strategies for new product development process, concurrent engineering, designing for costumer, Quality function deployment, designing products for manufacturing and assembly, technology forecasting and technology development process.

Process Design: Choice of technology, process flow characteristics, process selection decisions, process strategies, use of Break-even analysis in process/machine selection, product mix decisions, and use of linear programming techniques.

Strategic Capacity Planning: Capacity planning concept, long-range and short-range capacity strategies, economics scale, experience curve, capacity focus and flexibility, capacity planning, capacity planning in service verses manufacturing, adding capacity multi-site service growth

Process Flow Analysis and Layout Design: Types of processes, process flow structures, product-process matrix, process analysis, process flow design, process analysis, process flow chart, basic layout types computerized layout planning, travel chart and relationship chart, layout of line processes, assembly line balancing, and various balancing methods

Supply Chain Management: Supply chain, outsourcing, make or buy decision, value density, supplier selection, JIT purchasing, global sourcing and distribution.

Forecasting: Time series analysis techniques, linear regression, moving average, exponential smoothing, casual relationship forecasting, forecast error, choice of forecasting techniques, aggregate planning, operation planning overview, production planning environment, production strategies and aggregate planning strategies

Reference Books

1 Telsang Martand, "Industrial Engineering and production Management", S. Chand and co. Ltd. New Delhi.
2 Monks Joseph, "Operation Management Theory and problems", McGraw Hill Inc. New York
3 "Production and Operation Management (Manufacturing & Services) ", TMH New Delhi.
4 Korgaonkar, "Just in Time Manufacturing", Tata McGraw Hill Co. Ltd. New Delhi
5 Panneenselvam R., "Production and Operation Management", PHI New Delhi.
6 Riggs James, "Production System: Planning, Analysis and Control", John-Wiley and Sons New York.

ME589: COLLABORATIVE ENGINEERING

Teaching Scheme
Lectures: 4 hrs/week

Examination Scheme
Class Test – 20 marks
Teacher's Assessment – 20 marks
End Sem Exam – 60 marks

Objectives:

Develop concepts of cross functional team, Conceptual design, QFD for Design for Assembly, identify the various key parameters in Product Design for casting, molding, welding, forging, sheet mental operations, Work out force Analysis Analyze professional product design on basis of Cost, reliability, Value, safety, ergonomics, environment etc. Acquire knowledge of various software's of PLM, DFM, for new product design

Outcomes:

Apply the fundamental concepts cross functional team, Conceptual design, QFD for Design for Assembly in practice, Apply the knowledge in critical patterns developments, Improvement analytical ability in Product Design by considering casting, molding, welding, forging, sheet mental operations in professional practices, Apply knowledge of various software's, Cost, reliability, Value to design and develop new product and DFA and develop numerical ability to design new product

Collaborative PLM: Concept – product development through cross-functional teams supported by information and communication technologies, Product innovation, Product lifecycle, Product definition using QFD, Conceptual design, Concept evaluation.

Design for Manufacture: Design for moulding, Design for forging and welding, Design for sheet metal forming, Design for machining.

Design for Assembly: Design for use (ergonomics), Design for safety and reliability, Design for service/maintenance, Design for environment.

Design for Quality and Cost: Design for quality, Design to cost, Product cost estimation, Product lifecycle cost, important aspects affecting market competitiveness, Value engineering (self-study).

Product Lifecycle Engineering: Product data management**,** Product structure and storage, Workflow and project management, Change management, Distributed product data management, Web-based collaboration, Knowledge management, Collaborative engineering team, PDM/PLM systems, DFM/PLM software demonstration, Intelligent CAX/PLM, Future evolution.

Reference Books

1. Bralla J. G., "Handbook of Product Design for Manufacturing", McGraw-Hill, New York, 1986.

ME590: MACHINE TOOL DESIGN

Teaching Scheme
Lectures: 4 hrs/week

Examination Scheme
Class Test – 20 marks
Teacher's Assessment – 20 marks
End Sem Exam – 60 marks

Objectives:

Understand fundamental concepts machine tool drives, hydraulic transmission systems of machine tools, identify the forces in various machining operations, Carry out force Analysis professionally, Recognize and understand the standard speed and feed box design procedures for different machine tools. To acquire a skill to design and develop machine tool structure spindles and guide ways, CNC and DNC with practicing various analytical problems

Outcomes:

Recognize and apply the fundamental concepts of transmission system, Apply the knowledge of forces in machining to develop machine tool force diagrams, and improve analytical ability in professional practice in designing speed and feed boxes for various machine tools, Identify, Formulate Engineering problems in Machine tool Design, Enhance and develop professional skill of designing machine tool structures, spindles, guide ways of Universal, CNC and DNC machines

Machine Tool Drives and Mechanism: Machine tool drives, Hydraulic transmission, mechanical transmission, different types of driving mechanisms used in machine tools, requirements of machine tool design, force analysis in cutting in turning drilling and milling.

Regulation of Speed and Feed Rates in Machine Tools: Speed and feed rates regulation, design of speed box, design of feed box, Machine tool drives in multiple speed motors, special cases, gearing diagram, determination of number of tooth.

Design of Machine Tool Structures and Guide ways: Design criteria for machine tool structures, Static and Dynamic stiffness, Design procedure for design of bed, column, housing, bases and tables, Modern techniques in design of structures.

Design of Guide ways, Power screws and Spindles: Design of slide ways, design of aerostatic slide ways, combination guide ways, protecting devices of slide ways, design of power screws, design calculations of spindles. Antifriction bearings and sliding bearings, stability of machine tools, forced vibrations of machine tools

Machine Tool Control and Advance Design: Control systems for changing speed and feeds, automatic control of CNC machines, numerical control systems, design of NC and CNC machine tools

Reference Books

1. Basu S. K., "Design of Machine Tools", Allied Publishers
2. Acharkan, "Metal Cutting Machine Tools", Technical Publishing House
3. Bhattacharya A., Sen G. C., "Principles of Machine Tools",
4. Mehta N. K., "Machine Tool Design", Tata McGraw Hill
5. "Vibrations of Machine Tools", Machinery Publishing Co. Ltd., London
6. "Numerical Control", John Wiley, London

ME591: COMPUTER AIDED OPTIMIZATION

Teaching Scheme
Lectures: 4 hrs/week

Examination Scheme
Class Test – 20 marks
Teacher's Assessment – 20 marks
End Sem Exam – 60 marks

Objectives:

(1) Understanding and Analysis of optimization problems.
(2) Understanding of single variable and multi variable optimization.
(3) Analysis of problems within the defined limits.
(4) System development and problem solving by using specific algorithms.
(5) Modeling and performance analysis various optimization methods.

Outcomes:

(1) Comparative analysis of optimization methods.
(2) Analysis and use of single variable optimization.
(3) Understanding and Analysis of constrains in optimization.
(4) Selection and use of reliable optimization method for problem solving.

Introduction: Optimal problem formulation, engineering optimization problems, optimization algorithms.

Single Variable Optimization Algorithms: Optimality criteria, bracketing methods, region elimination methods, point estimation methods, gradient based methods, root finding using optimization techniques.

Multivariable Optimization Algorithms: Optimality criteria, unidirectional search, direct search methods, gradient based methods, Computer programs on above methods.

Constrained Optimization Algorithms: Kuhn-Tucker conditions, transformation methods, sensitivity analysis, direct search for constrained minimization, linearised search techniques, feasible direction method, generalized reduced gradient method, gradient projection method, Computer programs on above methods.

Special Optimization Algorithms: Integer programming, Geometric programming, Genetic Algorithms, Simulated annealing, global optimization, Computer programs on above methods.

Optimization in Operations Research: Linear programming problem, simplex method, artificial variable techniques, dual phase method, sensitivity analysis

Reference Books

1. Deb Kalyanmoy, " Optimization in Engineering Design", PHI, New Delhi
2. Rao S. S. "Engineering Optimization", John Wiley, New Delhi.
3. Deb Kalyanmoy, " Multi-objective Algorithms using Evolutionary Algorithms", John Wiley, New Delhi.
4. Paplambros P. Y. and Wilde D. J., "Principles of Optimum Design: Modeling and Computation", Cambridge University Press, UK
5. Chandrupatla, "Optimization in Design", PHI, New Delhi.

ME592: ENGINEERING ECONOMICS

Teaching Scheme
Lectures: 4 hrs/week

Examination Scheme
Class Test – 20 marks
Teacher's Assessment – 20 marks
End Sem Exam – 60 marks

Objectives:

To built up the knowledge of managerial economics and analysis of project considering economical concepts. Expertise in costing, finance and accounting related to the organization. Able to do corporate planning

Outcomes:

Implement the knowledge of managerial economics, costing, finance and cost accounting through analyzing engineering problems and economic analysis of projects.

Managerial Economics: The principle and use of economic analysis in engineering practice. Discounted cash flow analysis, corporate tax and investment, Depreciation and economic studies, replacement analysis, valuation of assets.

Economic analysis of projects, analysis of risks and uncertainty, elements of demand analysis and forecasting, theory of firm as owner and a producer, economics of scale, market model, production function, output and pricing decisions, long run and short sun cost curves

Costing and Finance: Review of double entry book keeping, preparation of ledger accounts, trial balance profit and loss account, balance sheet, income and expenditure account, fund flow analysis, analysis and interpretation of final accounts, ration analysis and inter firm comparison,

Cost account: Material and human resource accounting, overhead, fixed and variable costs, marginal costing, process costs, cost estimation and cost control,

Corporate Finance: Cost of capital and sources of funds, working capital management, budgeting and budgetary control

Corporate Planning: Corporate objectives, goals and policies, process of corporate planning, SWOT analysis, GAP analysis, strategy formulation, investment evaluation, capital budgeting, risk analysis, industrial dynamics.

Reference Books

1. Owler W., Brown J. L., "Cost Accounting and Cost Methods", 14th Ed., McDonald and Evans Publications
2. Kuchal S. C., Financial Management - An Analytical and Conceptual Approach", 10th Ed., Chaitanya Publishing House
3. Shukla M. S. and Grewal T. S., "Advance Accounts", S. Chand and Co., New Delhi
4. Theusan and Theusan, "Engineering Economics", 5th Ed., PHI, New Delhi
5. Dean Joel, "Managerial Economics", PHI, New Delhi
6. Hussey D. D., "Introducing Corporate Planning", Pergamon Press, New York, 1982

ME593: RELIABILITY ENGINEERING

Teaching Scheme
Lectures: 4 hrs/week

Examination Scheme
Class Test – 20 marks
Teacher's Assessment – 20 marks
End Sem Exam – 60 marks

Objectives:

To inculcate the knowledge of reliability and its applications to various engineering problems, with the use of probability theories matrices and decision making using event tree analysis, AGREE, ARINC techniques. To analyze engineering design using reliability concepts. Use of accelerated methods in reliability testing and FMEA

Outcomes:

To analyze engineering design and failure problems with implementation of reliability technique knowledge and its execution. To implement decision making process using event tree analysis and enhance the use of graph theory, RAM, RCM, CBM, HUM in engineering design along with FMECA

Introduction to Reliability and its applications to engineering, discussions on Reliability failure rate, Patters of Failure Distribution and Bathtub curve, Failure data collection and life estimation and Monte Carlo simulation of cumulative probability of failure of consistent components.

Survival probabilities of various systems having subsystems in series, parallel or combined configuration, Assessment of overall reliability by various methods: i) Star Delta, ii) Set theory, iii) Conditional Probability, iv) Matrix Method, v) Event Tree Analysis, Allocation of Reliability through programming and other algorithms, through proper appointment of unreliability's, AGREE, ARINC and other methods

Reliability in Engineering Design: Carter's concept of reliability, and Safety Margin in a structural mechanical design, Hazard Analysis through RPN & Graph theory, Through stacking of dimensional tolerance, Reliability Effort Function, Reliability, Availability and Maintainability (RAM), Life Cycle Cost – algorithms, mathematical models & nomograms, Non-Parametric Analysis: Mean and Median Ranking Statistics

Accelerated Method of Reliability Testing-Variable, attribute and K Statistic, Truncated Test, Reliability Centered Maintenance (RCM): Predictive Preventive Maintenance, Diagnostic Techniques used in PPM, Condition Monitoring leading to CBM, HUM

Failure Modes and Effect Analysis (FMEA), Failure Modes, Effects and Criticality Analysis (FMECA)

Reference Books

1. Dhillon Balbir S., "Reliability Engineering in Systems Design & Operation", N.Y. Van Nostrand Reinhold, 1983
2. "Handbook of Reliability Engineering & Management", McGraw Hill, New York, 1988
3. Shrinath L. S., "RIiability Engineering", 3rd Edition, Revised Affiliated East West Press, 1991
4. Misra K. B., "Reliability Analysis and Prediction : A Methodology Oriented Treatmebnt

ME594: FLEXIBLE MANUFACTURING SYSTEMS

Teaching Scheme
Lectures: 4 hrs/week

Examination Scheme
Class Test – 20 marks
Teacher's Assessment – 20 marks
End Sem Exam – 60 marks

Objectives:-

1. To introduce and discuss flexible manufacturing concepts.
2. To expose the student to the different types of manufacturing available today such as the Special Manufacturing System, the Manufacturing Cell, and the Flexible Manufacturing System (FMS), the automated flow lines, the common CAD/CAM data base organized to serve both design and manufacturing.
3. To study about group technology, computer aided process planning, material requirement planning (MRP), Computer aided quality control and Flexible manufacturing systems.
4. To study the use computers in the area of manufacturing to reduce manual processing and linking computers to all the manufacturing machines and increase the productivity, reduce the unnecessary costs.
5. To provide information on flexible manufacturing systems,

Outcomes:-

1. Identify how automation can be used in production systems.
2. Recall basic elements of automation, and automation strategies.
3. Apply group technology, cellular manufacturing, computer aided process planning, material requirement planning (MRP), and Computer aided quality control for the analysis and design of flexible manufacturing systems.
4. Identify the use of computer technology in manufacturing to improve productivity.

FMS concept, CAD-CAE-CAM, components of FMS, flexibility in manufacturing, volume variety relationship, FMS workstation, machining centers, application and benefits, building blocks of FMS, FMS control.

FMS layout, planning for the FMS, analysis and optimization of FMS, organization and information processing in manufacturing, production concepts and mathematical models (numerical), automation strategies.

Automated flow lines, methods of work-part transport, transfer mechanisms, buffer storage, control functions, automation for machining operations, analysis of transfer lines without storage, concept of partial automation, automated flow lines with storage buffers (numerical).

Automated assembly systems, types, design for automated assembly system, part feeding devices, Analysis of multi station and single station assembly machines (numerical), Automated inspection and testing, principles and methods, sensor technologies, CMM, machine vision, contact and non-contact inspection methods, optical inspection methods.

Function of computer in FMS, computer process interface, computer process monitoring, computer process control types, programming for computer process control, GT, CAPP, CAQC in FMS.

Reference Books

1. Kundra, Tiwari, "Computer Aided Manufacturing", Tata McGraw Hill Publications
2. Groover M. P., "Automation, Production Systems and CIM", PHI Pvt. Ltd. Publications
3. Kusiak A., "Modeling and Design of FMS", Elsevier Science Publishers
4. Raouf A., Ahmed S.I., "Flexible Manufacturing", Elsevier Science Publishers
5. Ranky P.G., "Flexible Manufacturing Cells & Systems in Cim", Guildford Survey, UK
6. Ranky Paul G., "Design and operation of FMS", Guildford Survey, UK
7. Vishwanathan N., Narhari Y., "Performance Modelling of Automated Manufacturing System" PHI Publications

ME595: FACILITY PLANNING AND MATERIAL HANDLING SYSTEMS

Teaching Scheme
Lectures: 4 hrs/week

Examination Scheme
Class Test – 20 marks
Teacher's Assessment – 20 marks
End Sem Exam – 60 marks

Objectives:

(1) Analysis of the material flow in an organisation.
(2) Analysis of Material Handling equipments and their effective use.
(3) Understanding of Human factor in Material handling.
(4) Improvement in the organisational layout and departmental interrelationship.
(5) Space analysis in the economics of a plant.

Outcomes:

(1) Improvement in the techniques of material flow in an organisation.
(2) Effective utilisation of material handling equipments.
(3) Improvement in the safety environment by proper selection of Material handling systems.
(4) Improvement in Layout of the organisation as a whole.
(5) Improvement in the economics of plant layout.

Introduction: Basic material handling concepts. Unit load concept, principles of material handling. Classification: Unit bulk: Relationship to safety, material management, project management principles as applied to material handling.

Material flow: Master flow pattern, material or product handling methods, processes, general flow patterns, flow planning criteria, design of a flow pattern, techniques for analyzing materials flow.

Materials handling equipments: classification, Industrial hand trucks: Two wheeler hand trucks, multiple wheel floor trucks, hydraulic and mechanical handling trucks, powered trucks-automated guided vehicles, Conveyors: Package handling, vertical lift, overhead trolley, power and unit load conveyers, Cranes, hoists and monorails-bridge, gantry and jib cranes, Storage equipment and systems, positioning equipment such as lift tables, power dumpers, die handling, industrial robots, Bulk material handling: Bins, hoppers, feeders belt, chain, screw, vibratory conveyers, pneumatic conveyers bucket elevators, escalators.

Selection of material handling system for various applications like production shop, foundry etc., factors affecting handling systems, constructing a layout,
Safety environment and human factor in material handling, safety in industry, dust control, noise control

Facilities design function: Scope, importance, objectives, enterprise design process, types of layout problems, good layout organization of layout department and relationship with other department.

Common problems in plant layout, planning activity relationship, Types of activities Relationship, diagrams production and physical plant services, receiving storage, office, parking, equipment, line balancing, flexibility, expansion facility

Space determination and area allocation: Space planning for offices, storage, production and other activities, factors considered in area allocation such as expansion, selection and economics of site, economic of plant layout.

Reference Books

1. Apple James M., "Plant Layout and Material Handling", John Wiley and Sons.
2. Moore James M., "Plant Layout and Design", Macmillan Publishing Inc. New York.

3. Kuwiec Raymond A., "Material Handling Handbook", Sponsored by the American Society of Mechanical Engineering & International Material Management Society, John Wiley & Sons New York.
4. Rudenko, "Material Handling Equipment"
5. Alexander, "Material Handling Equipment", MIR Publications

ME596: LABORATORY – II

Teaching Scheme
Tutorial: 2 hrs/week

Examination Scheme
Term Work – 50 marks

Objectives: Acquiring knowledge of report writing

Outcomes: Enhancing knowledge about writing reports

The laboratory work will consist of assignment on report writing, various norms to be followed for report writing, paper writing and presentations.

The use of report writing software shall be followed for writing reports.

ME597: SEMINAR – II

Teaching Scheme
Tutorial: 2 hrs/week

Examination Scheme
Term Work – 25 Marks
Viva voce – 25 marks

Seminar – II should be based on literature survey on any topic preferably in continuation with the Seminar – I. It will be submitted as a report of about 25 pages of 'A4' size sheets in either comb or hard bound.

The candidate will have to deliver a seminar presentation in front of the examiners, one of them will be guide and other will be the examiner appointed by DSB. The performance of the student will be evaluated by both examiners jointly based on the content of the seminar, delivery of seminar and answers to the queries of the examiners.

GE611: RESEARCH METHODOLOGY

Teaching Scheme:
Theory: 4 hours/week

Examination Scheme:
Class Test: 20 Marks
Teacher's Assessment: 20 Marks
End Sem Exam: 60 Marks

Objectives:

The objective of this course is to expose the post graduate students to basic methodologies and techniques of carrying out research work which will be helpful for Dissertation work.

Outcomes:

Selection of research problem, formulation, analysis and report writing of work undertaken

Unit-I

Objectives of Research, Research Approaches, Significance of Research, Research Methods versus Methodology, Research and Scientific Method, Research Process, Criteria of Good Research, Defining the Research Problem, Selecting the Problem, Technique Involved in Defining a Problem, Research Design, Important Concepts Relating to Research Design, Developing a Research Plan, Literature review.

Unit-II

Basic Concepts of Probability, Probability Axioms, Measures of Central Tendency, Measures of Dispersions, Measures of Symmetry, Measures of Peakedness. Regression Analysis – Simple Linear Regression, Multiple linear Regression, Correlation. Tests of Hypothesis and Goodness of Fit: Definition of null and alternative hypothesis, students't' distribution: properties, application with example. Chi-square distribution: definition, constants of Chi-square distribution. Application with example. F-test: example of application.

Unit-III

Optimization Techniques: Linear Programming, Simplex Method, Dual Simplex, Sensitivity Analysis. Artificial Variable Technique, Dynamic Programming, Introductory concepts of non-linear programming.

Or

Unit-III

Modeling and simulation:

Introduction to modeling: Concept of system, continuous and discrete systems.
Experimental Methods:
Importance of experimental analysis, guidelines for designing experiments, uncertainty and error analysis, concept of uncertainty, propagation of uncertainty, planning experiments from uncertainty analysis.

Unit-IV

Fuzzy logic: Introduction, Concepts, Basic Fuzzy Mathematical Operations, Fuzzy databases, Membership Functions, Fuzzy Linear Programming, Neural Networks: Artificial Neural Networks, architectures and algorithms, Basic neuron models, Neural network models, Learning algorithms, Genetic Algorithms: Introduction to genetic algorithm, Operators, Applications.

Unit-V

Interpretation and Report Writing: Meaning of Interpretation, Techniques of Interpretation, Significance of Report Writing, Steps in Writing Report, Layout of the Research Report, Types of Reports, Oral Presentation, Mechanics of Writing a Research Report, Writing a technical paper, plagiarism and its implications.

References:

1. S.P.Gupta, " Statistical Methods", S. Chand & Sons.
2. Kothari C.R.(2011), " Research Methodology-Methods and Techniques", New Age International Publishers, New Delhi.
3. Gupta S.L. and Gupta Hitesh (2011), "Research Methodology-Text and cases with SPSS applications" International Book House Pvt. Ltd., New Delhi.
4. Rao V and H. Rao, (1996), "C^{++}, Neural Networks and Fuzzy Logic", BPB Publications, New Delhi.
5. Goldberg, D.E. (2000), "Genetic Algorithms in Search, Optimization & Machine Learning", Addison Wesley Longman (Singapore) Pte. Ltd., Indian Branch, Delhi.
6. George J. Klir and Bo Yuan (2010), "Fuzzy Sets and Fuzzy Logic", PHI Learning Pvt. Ltd, New Delhi

ME611: DISSERTATION PART-I

Teaching Scheme
Tutorial: 20 hrs/week

Examination Scheme
Term Work – 50 marks
Practical – 50 Marks

The dissertation shall consist of a report on any research work done by the candidate or a comprehensive and critical review of any recent development in the subject or detailed report of the project work consisting of a design and / or development work that the candidate has executed. The dissertation will consist of two parts as dissertation part- I and dissertation II

Term work

The dissertation part I will be in the form of seminar report on the dissertation work being carried out by the candidate and will be assessed by two examiners appointed by the DSB, one of whom will be the guide and other will be a senior faculty member from the department.

Practical /Oral

The oral examination will be based on presentation on the dissertation work being carried out by the candidate and will be assessed by two examiners appointed by the DSB, one of whom will be the guide and other will be a senior faculty member from the department.

GE 612: ENVIRONMENTAL STUDIES

Unit 1: The multidisciplinary nature of environmental studies

Definition, scope and importance, Need for public awareness.

Unit 2: Natural Resources

Renewable and non renewable resources:

a) Natural Resources and associated problems
   - Forest resources: Use and over-exploitation, deforestation, case studies, Timber extraction, mining, Dams and their effects on forests and tribal people.
   - Water resources: Use and over utilization of surface and water, floods, drought, and conflicts over water, dam's benefits and problems.
   - Food Resources: World food problems, changes caused by agriculture and over grazing, effects of modern agricultures, fertilizers-pesticides problems, water logging, salinity, case studies.
   - Energy Resources: Growing energy needs, renewable energy sources, use of alternate energy sources, case studies.
   - Land Resources: land as resources, land degradation, man induces landslides, soil erosion, and desertification.

b) Role of individuals in conservations of natural resources.

c) Equitable use of resources for sustainable life styles.

Unit 3: Eco systems

- Concepts of an Eco systems
- Structure and function of Eco systems
- Procedure, consumers, decomposers.
- Energy flow in the Eco systems
- Ecological suggestions
- Food chain, food webs and ecological pyramids
- Introduction, types, characteristics features, structure and function of the following eco systems
- Forest eco systems
- Grass land eco systems
- Desert eco systems
- Aquatic eco systems(ponds, streams, lake, rivers, oceans, estuaries)

Unit4: Biodiversity and its conservation

- Introduction**-** Definition: genetics, species and eco systems diversity
- Biogeographically classification of India
- Value of biodiversity: Consumptive use, productive use, social, ethical,ascetics and option values
- Biodiversity at global, national and local level.
- India as a mega diversity nation.
- Hot-spots of Biodiversity
- Threats to Biodiversity: habitat loss, poaching of wildlife, man wildlife conflicts
- Endangered and endemic spaces of India

- Conservation of Biodiversity: in-situ and ex-situ conservation of Biodiversity

Unit 5: Environmental Pollution

Definition Causes, effects and control measures of:

a. Air pollution
b. Water pollution
c. Soil pollution
d. Marine pollution
e. Noise pollution
f. Thermal pollution
g. Nuclear Hazards

Solid waste management: Causes, effects and control measures of urban and industrials wastes
Role of an individual in prevention of pollution case
studies
Disaster management: Floods, earthquake, cyclone and land slides

Unit6: Social issues and the environment

- Form unsustainable to sustainable development
- Urban problems related to energy
- Water conservation, rain water harvesting, water shed management
- Resettlement and rehabilitation of people; its problems and concerns, case studies
- Environmental ethics: issues and possible solutions
- Climate change, global warming, acid rain,ozone layer depletion, nuclear accidents and holocaust, case studies
- Waste land reclamation
- Consumerism and waste products
- Environment protection act
- Air (prevention and control of pollution) act
- Water (prevention and control of pollution) act
- Wild life protection act
- Forest conservation act
- Issues involved in enforcement of environmental legislations
- Public awareness

Unit 7: Human population and the environment

- Population growth and variation among nations
- Population explosion – family welfare program
- Environment and human health
- Human rights
- Value education
- HIV/AIDS
- Women and child welfare

- Role of information technology in environment and human health
- Case studies

Unit 8: Field work

Visit to a local area to document environment Assets River / forest / grassland / hill / mountain. Visit to a local polluted site – urban / rural / industrial / agricultural. Study of common plants, insects, birds. Study of simple ecosystems – pond, river, hills lopes, etc. (field work equal to 5 lecture works)

Recommended Books:

1. Textbook of Environmental studies, Erachbharucha, UGC
2. Fundamental concepts in Environmental Studies, D D Mishra, S Chand & Co. Ltd.

ME612: DISSERTATION PART – II

Teaching Scheme
Tutorial: 24 hrs/week

Examination Scheme
Term Work – 50 marks
Viva voce – 150 marks

The dissertation part – II will be in continuation of dissertation part – I and shall consist of a report on the research work done by the candidate or a comprehensive and critical review of any recent development in the subject or detailed report of the project work consisting of a design and / or development work that the candidate has executed. The examinee shall submit the dissertation in triplicate to the head of the institution duly certified by the guide and the concerned head of department and the principal that the work has been satisfactorily completed.

Term work

The dissertation will be assessed by two internal examiners appointed by the DSB, one of whom will be the guide and other will be a senior faculty member from the department.

Viva voce

It shall consists of a defense presented by the examinee on his work in the presence of examiners appointed by the DSB, one of whom will be the guide and other will be an external examiner.