MMIE/MMIP/MMCM/MMMD/MMTP/MMPD – 101 Advanced Mathematics

UNIT 1
Linear Algebra: Linear transformation, vector spaces, hash function, Hermite polynomial, Heavisite's unit function and error function. Elementary concepts of Modular mathematics

UNIT 2
Solution of Partial Differential Equation (PDE) by separation of variable method, numerical solution of PDE (Laplace, Poisson's, Parabolic) using finite difference methods, Elementary properties of FT, DFT, WFT, Wavelet transform, Haar transform.

UNIT 3
Probability, compound probability and discrete random variable, Binomial, Normal and Poisson's distributions, Sampling distribution, elementary concept of estimation and theory of hypothesis, recurred relations.

UNIT 4
Stochastic process, Markov process transition probability transition probability matrix, just and higher order Markov process, Application of Eigen value problems in Markov Process, Markov chain. Queuing system, transient and steady state, traffic intensity, distribution queuing system, concepts of queuing models (M/M/1: Infinity/ Infinity/ FC FS), (M/M/1: N/ Infinity/ FC FS), (M/M/S: Infinity/ Infinity/ FC FS)

UNIT 5
FEM: Variational functionals, Euler Lagrange's equation, Variational forms, Ritz method, Galerkin's method, descretization, finite elements method for one dimensional problem.

Reference Books:

1. Higher Engineering Mathematics by B.V. Ramana, Tata Mc Hill.

2. Advance Engineering Mathematics by Ervin Kreszig, Wiley Easten Edd.

3. Applied Numerical Methods with MATLAB by Steven C Chapra, TMH.

4. Introductory Methods of Numerical Analysis by S.S. Shastry,

5. Introduction of Numerical Analysis by Forberg

6. Numerical Solution of Differential Equation by M. K. Jain

7. Numerical Mathematical Analysis By James B. Scarborogh

8. Fourier Transforms by J. N. Sheddon

9. Advance Mathematics for Engr and Sc, Spiegel, Schaum Series, TMH

MMCM – 102 Operations Management

Unit 1
Operations Management (OM): Definition, history, industrial and IT revolution (ERP); tangible and service products continuum, employment shift from agriculture, manufacturing to service; customer orientation; basic process formats on product volume-variety graph; concept of raw process time, critical WIP, bottle neck thruput and cycle-time with example of Penny-Fab-1,2; Little's law, best and worst case performance, thruput and cycle time formula in practical-worst-case; criteria of performance, decision area, business strategy, environment scan, SWOT, Porters' five forces, core competency, competitive priorities of cost, quality, time and flexibility, order winners; production strategy of Make To Order-MTO, MTS and ATO (assemble to order); productivity, standard of living and happiness.

Unit 2
Product:-Life Cycle and PLC management; design steps, evolution and innovation, traditional v/s concurrent design, form and functional design, simplification and standardization, differentiation/ mass customization, modular design, design for mfg and environment (DFM, DFE), technologies used in design. Service characteristics and classification based on people-things v/s direct-indirect service actions, service triangle of customer, provider and system; technical and functional (delivery) service quality and other service performance factors, Valerie's service quality model; globalization of services.

Unit 3
Processes: transformation and value addition, selection based on cost, quality and flexibility considerations; reliability, failure density and hazard rate graphs for constant hazard bath-tub curve, series and parallel components, MTBF; availability and maintainability, preventive maintenance, TPM; value analysis; replacement models; Quality-definition, Taguchi loss function, cost of quality, chain action of improving quality to productivity to motivation and low cost; product and process specs; the funnel-marble experiment and variance reduction, process capability, six sigma and its implementation by DMAIC, QFD, TQM and ISO-9000.

Unit 4
Plant-facilities: Impact of organization strategies on choice of region and site, existing or new organization, decision-affecting factors for location, load distance, dimensional and factor analysis methods, Brown-Gibson model, foreign locations, non-profit govt. services (health, school) locations. facility layout objectives and factors, basic layouts, merits and optimization; subjective relationship ranking method, computer programs CRAFT and 3-d modeling; problems of inventories flow and operators in process layout and inflexibility in product layout, flexible cellular layout, group technology; capacity and equipment selection, importance of spare capacity to reduce Q-length and cycle time.

Unit 5

Programs/ procedures of production control (PPC): corporate and production planning process, aggregate plan, master production schedule and material planning; matching supply to demand fluctuations over time horizon, Forecasting elements, time series, regression, causal and Delphi methods; use of LP in aggregate plan and HMMS model, assembly line balancing, elemental task, station time and cycle time, balance delays; sequencing, Johnson method for n-job 2/3 m/c, NP hard job-shop sequencing, heuristic dispatch rules; synchronous mfg, TOC, drum-buffer-rope and focus on bottleneck as control point; JIT lean mfg, Kanban and CONWIP shop floor controls, Kaizen.

References:

1. Chary SN; Production and Operations Management; TMH
2. Hopp W and Spearman M; Factory Physics; TMH
3. Gitlow Howard et al; Quality Management; TMH
4. Stevenson W J; Operations Management; TMH
5. Khanna RB; Production and Operations Management; PHI
6. Vollman, Berry et al; Manufacturing planning and control for SCM; TMH.
7. Chase Richard B et al; Operations management; SIE-TMH
8. Adam EE and Ebert RJ; Production and Operations Management Concepts…; PHI Learning.

MMCM – 103 CAD-CAM-CIM

UNIT- I
CAD: Parametric representation of Analytical and Synthetic Curves. Surface Models: Parametric Representation of Analytical and Synthetic Surfaces. Solid Modeling : Boundary Representation, Constructive Solid Geometry, Parametric and Variational modeling, Feature Based Modeling, Product Data Exchange (DXF, IGES and STEP), Introduction of CAD software and Hardware.

UNIT-II
CAM & CIM : Online and Offline CAM, Fields of CAM, Computers Integrated Manufacturing Definition, CIM wheel concept, Evolution of CIM, Computer Numerical Control: Concepts and Types, Position and motion control, Constructional features of NC machines, CNC, DNC and Machine Center, Adaptive Control.

UNIT-III
CNC Programming: Programming of CNC Lathe and Milling machine for common machining operations. Absolute and Incremental Programming. Canned cycles of CNC milling machine. Introduction to Computer Assisted Part Programming

UNIT-IV
Group Technology and CAPP: Concept, Part family formation, Part Classification and Coding Systems types, OPITZ system, Production Flow Analysis, Composite Part Manufacturing and Machine Cell formation. Computer Aided Process Planning and its Types, Design For Manufacturing and Assembly.

UNIT-V
Robotics and Flexible Manufacturing Systems: Robotics: characteristics and classification, anatomy and configurations, introduction to robot kinematics, robot applications. Concept, Components and Types. Automated Storage and Retrieval Systems, AGVs and their types, Adoption Strategies of FMS, Flexibility Analysis. FMS Scheduling.

Books & References Recommended:

1. Groover, Production System & Computer Integrated Manufacturing, PHI.
2. Zeid, CAD/CAM Theory & Practice, McGrawHill
3. Principles of Computer Integrated Manufacturing: S. Kant Vajpayee – PHI
4. CAD CAM, Principles, Practice and Manufacturing Management, Chris McMahon, Jimme Browne- Pearson Education Asia

MMCM – 104 Mechatronics

UNIT- I
Mechatronics: Definition and scope; Electro-mechanical engineering devices;Sensors and Transducers for automated manufacturing systems; Review of displacement, position, proximity, pressure, temperature, force, torque, light sensors; Selection of sensors, MEMS.

UNIT- II
System Transfer Function & Frequency Response; Function and frequency response of first and second order systems; Systems with feedback loops, frequency response, Bode plots, performance specifications, stability; closed loop controllers

UNIT- III
Operational amplifiers, filtering of signals, digital signals, AD and DA conversion, multiplexers, data acquisition; Proportional, derivative, integral, PID controllers, system performance, and controller tuning

UNIT- IV
Actuators: Review of Pneumatic and Hydraulic systems; Pressure and Directional control valves, rotary actuators; Electrical actuation systems; D.C., A.C. motors; series and stepper motors, speed control, solid-state switches, solenoids, applications of pneumatic & hydraulic controllers.

UNIT- V
Digital logic; Logic gates, Boolean algebra; Microprocessors; Microcomputer structures and micro controllers, programming, assembly language, input output systems; Programmable logic controls; Microprocessor based controllers.

Books & References Recommended :

1. Alciatore and Histand, *Mechatronics and Measurement System*, TMH
2. Bolton, W., *Mechatronics*, Thomson Press (India) Ltd.
3. Lawrence J Kamm, *Understanding Electro-Mechanical Engineering-An Introduction to Mechatronics*, PHI

MMCM – 105 Manufacturing Science

UNIT- I

Manufacturing properties of materials; metals, alloys & their applications in tool design
Metal casting processes, design principles for pattern mould and die
Hot & cold working of metals; forming processes- introduction to rolling, forging, wire and tube drawing extrusion, high energy forming. Sheet metal operations and die design

UNIT- II

Mechanics of metal cutting orthogonal and oblique cutting, shear angle relationship, different models, Estimation of temperature in metal cutting. Cutting tools, tool wear, cutting fluids, numerical control of machine tools

UNIT- III

Joining processes- Arc Welding processes and their parameters. Welding of steel, C.I., Stainless Steel and Aluminum. Automation in welding.

Modern Machining Processes: Classification: EDM, ECM, USM, AJM, Laser and Plasma arc machining, EBM.

UNIT- IV

Production Tooling: Design of Jigs and Fixtures, Design of dies for sheet metal operations. Mould Design for Injection, Blow and Extruded Plastic Parts

UNIT- V

Metrology- Standards of Measurements: Linear and Angular Measurement, Limits & Fits, and Limits gauge design, Assembly Tolerancing, Measurement of surface roughness. Geometrical and Form errors

Books & References Recommended :

1.   Parmar R. S., Welding Processes and Technology.
2.   Jain P. L., Principle of Foundry Technology.
3.   Lindberg, Manufacturing Processes and materials of Manufacture - PHI
4.   ASME, Fundamentals of Tool Design.
5.   P C Sharma, A Textbook of Production Engineering, S Chand. & Co.
6.   Rosenthal, Principles of Metal casting -TMH