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 – 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