

MEPE – 101 Advanced Mathematics

UNIT I

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

UNIT II

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

UNIT III

Stochastic process, Markov process transition probability transition probability matrix, just and higher order 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 IV

Operations of fuzzy sets, fuzzy arithmetic & relations, fuzzy relation equations, fuzzy logics. MATLAB introduction, programming in MATLAB scripts, functions and their application.

UNIT V

Introduction and definition of reliability, derivation of reliability functions, Failure rate, Hazard rate, mean time to failure & their relations, concepts of fault tolerant analysis, Elementary idea about decision theory and goal programming.

Reference Books:

1. Higher Engineering Mathematics by B.V. Ramana, Tata Mc Hill.
2. Advance Engineering Mathematics by Ervin Kreszig, Wiley Eastern Edd.
3. Applied Numerical Methods with MATLAB by Steven C chapra, Tata Mc Graw Hill.
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. Scarborough
8. Fourier Transforms by J. N. Sheddon
9. Fuzzy Logic in Engineering by T. J. Ross
10. Fuzzy Sets Theory & its Applications by H. J. Zimmersoms

MEPE – 102 Power Electronics Devices and Phase controlled circuits

UNIT- I

Review of power switching devices i.e. Thyristor, MOSFET, GTO, IGBT, BJT, MCTS. Trigger techniques optical isolator, protection circuit, isolation transformer Natural and forced commutation of SCR.

UNIT - II

Phase controlled rectifier configuration. Control of output voltage by sequence and sector control. Reduction on harmonics using multiple pulse control, design of rectifier circuit. Comparative aspects of design using convertor transformer forced sell turn off devices. Design of Chopper circuit, reduction of harmonic circuit, multiphase choppers. Analysis of rectifier and chopper circuit.

UNIT – III

Single phase and three phase controllers. Triggering techniques. Concept of dual converters. Circulating and non circulating current. Mode of operation. Regenerative braking

UNIT – IV

Concepts of three phase to single phase and three phase to three phase cycloconverter. Symmetrical and asymmetrical control. Harmonic analysis of output voltage.

UNIT – V

Line commutated inverters, Margin angle, HVDC, Converter reactions on load side and source side.

BOOKS:

1. Power Electronics M.H. Rashid
2. Power Electronics Ned Mohan
3. Power Electronics P.C. Sen
4. Hand book of Power Electronics M.H. Rashid
5. Power Electronics M.D. Singh

MEPE – 103 Advanced Control System

UNIT – I

Rewiew of Linear Control System: Modeling through differential equations and difference equation, state space method of description and its solution, discretization of continuous-time state space model, Laplace and z-domain analyses of control systems, Controllability, operability & Stability, Dode & Nyquist analysis, Root Loci, Effect of load disturbance upon control actions.

UNIT-2

Development of feedback control laws through state space technique modal control, pole placement problem.

UNIT-III

Variable Structure control and its applications. Examples on variable structure control.

UNIT-IV

Control of nonlinear dynamics: Lyapunov based control function, Phase plane technique, Liapunov stability analysis.

UNIT –V

Optimal control: Calculus of variation, Euler-Lagrange equations, Boundary conditions, Transversal condition Bolza problem, Pontyazin's maximum principle.

Books

1. Automatic Control System – B.C. Kuo, Prentice Hall, New York, 1975
2. Modern Control Engineering K. Ogata, Prentice Hall of India Ltd. New Delhi, 1992
3. Digital control system B.C. Kuo Oxford Pub.
4. Discrete Time Control Systems – K. Ogata. Prentice Hall of India Ltd. New Delhi.
5. Optimum System Control Andrew P. Sage, Prentice Hall New York, 1970
6. Advanced Control System- B.S.Manake,Khanna Publication

MEPE – 104 Forced Commutation Circuits

UNIT – 1

Inverter principles, Commutation techniques. Different types of single phase and three phase inverters, voltage control techniques.

UNIT-II

Current sourced and voltage sourced inverters, Waveform synthesis, voltage Frequency and phase sequence control, voltage and current relations, Harmonics study.

UNIT-III

Principles and classification of chopper circuits, analysis of practical choppers for single two and four quadrant operation, Device selection, Control circuits, Switch mode power supplies, Square wave switching, Resonant mode operation of power supplies, Ferroresonant, Linears and the switchers.

UNIT-IV

Induction heating, induction welding and Melting. Application to Dielectric heating. Medium frequency supplies for induction heating, high frequency sources for fluorescent lamps. R.F. generators, Laser power supply.

UNIT-V

Power supplies for SRM drive, power supplies for AC and DC drives, Device ratings, Device Data sheets. Safe operating areas. Control circuits.

BOOKS:

1. Power Electronics M.H. Rashid
2. Power Electronics Ned Mohan
3. Power Electronics P.C. Sen
4. Hand book of Power Electronics M.H. Rashid
5. Power Electronics M.D. Singh

MEPE – 105 Electric Drives

UNIT – 1

Introduction: concept of electric drives, types of drives, speed torque characteristics of various electric drives. Starting methods for DC shunt and series motor and three phase induction and synchronous motors, expressions for starting current and starting torque. Electric braking of electric drives, types of braking, speed torque characteristics of electric drives under braking conditions. Reversal of electric drives.

UNIT-II

Speed control: fundamental parameters of speed control of dc motors. Field control and armature control characteristic constant torque and constant HP Characteristics a.c. motors variable frequency pole changing variable resistance in stator and rotor circuit, voltage injection in the rotor circuit characteristics.

UNIT-III

Transient condition basic concept regarding transients in drives analysis of transient condition during starting braking reversal and sudden loading of dc drives energy involved in transient process analysis of transient behavior of the phase induction drive while starting and braking.

UNIT-IV

Solid state control advantage of using solid state control drives in industrial field principle of working block diagram and characteristics obtained in dc shunt, series and compound motors. Three phase induction and synchronous motor for adjustable speed drives.

UNIT-V

Estimation of motor rating and drive selection: types of duty cycles calculation of motor rating for various duty cycles load diagram. Load equalization flywheel calculations permissible frequency of starting of squirrel cage motor general consideration in selection of drive for industrial applications.

BOOKS:

- Ned Mohan, T.M. Undeland, W.P. Robbins, Power Electronics-Converters, Applications and design", John Wiley & Sons.
- J.M.D. Murphy, F.O. Turnbull, "Power Electronic Control of AC motors", Pergamon Press.
- P.C. Sen, D.C. drive, Pergamon Press
- B.K. Bose, Power Electronics & AC drive prentice Hall.
- Dubey G.K. "Power semi Conductor controller drives, Prentice Hall.
- Vedam Subramanyam, "Electrical Drives".
- T.J.E. Miller, Switched Reluctance & P.M. B.L. DC motor, Pergamon Press