ADVANCED MATHEMATICS
MEPE – 101

Unit 1 : Partial Differential Equation
Solution of Partial Differential Equation (PDE) by separation of variable method, Numerical solution of PDE (Laplace, Poisson's, Parabola) using finite difference Methods.

Unit 2 : Matrices And Linear System Of Equations
Solution of linear simultaneous equations by Gaussian elimination and its modification, Crout's triangularization method, Iterative methods-Jacobins method, Gauss-Seidal method, Determination of Eigen values by iteration.

Unit 5 : Calculus Of Variations
Euler-Lagrange's differential equation, The Brachistochrone problems and other applications. Isoperi-metric problem, Hamilton's Principle and Lagrange's Equation, Rayleigh-Ritz method, Galerkin method.

Unit 4 : Fuzzy Logic
Operations of fuzzy sets, fuzzy arithmetic & relations, fuzzy relation equations, fuzzy logics. MATLAB introduction, programming in MATLAB scripts, functions and their application.

Unit 5 : Reliability
Introduction and definition of reliability, derivation of reliability functions, Failure rate, Hazard rate, mean time t future & their relations, concepts of fault tolerant analysis.

Reference Books:
1. Higher Engineering Mathematics - by Dr. B.S. Grewal; Khanna Publishers
2. Calculus of Variations - by Elsgole; Addison Wesley.
3. Applied Numerical Methods with MATLAB by Steven C Chapra, TMH.
4. Introductory Methods of Numerical Analysis by S.S. Shastry,
5. Calculus of Variations - by Galfand & Fomin; Prentice Hall.
6. Higher Engineering Mathematics by B.V. Ramana, Tata Mc Hill.
7. Advance Engineering Mathematics by Ervin Kreszig, Wiley Easten Edd.
8. Numerical Solution of Differential Equation by M. K. Jain
9. Numerical Mathematical Analysis By James B. Scarborogh
10. Fuzzy Logic in Engineering by T. J. Ross
11. Fuzzy Sets Theory & its Applications by H. J. Zimmersoms

POWER ELECTRONICS
MEPE 102

Unit-I

An overview of PSDs, 1-Phase and 3-Phase Controlled rectifiers-Average output voltages and currents for R-L. Load performance parameters of rectifier 1- Phase and 3- Phase converter.

Unit-II

DC-DC converters: Buck, Boost, Buck-boost and Cuk converters, linear power supplies. Switch mode DC Power supplies, Fly back converter, Forward converter, push pull converter, half bridge and full bridge converter.

Units-III

Basic concepts of switch mode inverter, pulse width modulated switching scheme , unipolar and bipolar Switching scheme, 1-o inverters, push pull inverters, 3-Phase inverters, PWM in 3-Phase voltage source inverters. Reduction of Harmonies, square wave pulse switching, programmed Harmonic elimination switching, SVM technique.

Unit-IV

Resonant pulse Converters: Classification of resonant Converters, series Resonant Inverter: Series Resonant inverters with unidirectional switches, series resonant inverters with bi-directional switches. Parallel Resonant Inverters, Zero current switching resonant converters, zero voltage switching resonant converters.

Unit-V

Multi-level inverters – switching dc power supplies – power conditioners & UPS, AC voltage controllers – matrix converter

Unit-VI

Design aspects of converters, Protection of devices and circuits.

Books for Reference

1. Power electronics, Circuits, devices. Application by M.H.Rashid (PHI)
2. Power electronics converters. Applications and Design N.Mohan undeland and Robbins John wily and sons inc.
3. Modern Power electronics and AC Drives by B.K .Bose.

MODERN CONTROL SYSTEM

MEPE – 103

UNIT- I

Development of feedback control laws through state space technique modal control, pole placement problem. Variable Structure control and its applications. Examples on variable structure control.

UNIT – II

Nyquist stability criterion, assessment of relative stability using Nyquist Criterion (phase margin, gain margin and stability), closed-loop frequency response.

UNIT – III

Control of nonlinear dynamics: Lyapunov based control function, Phase plane technique, Liapunov stability analysis. Linear Continuous time model for physical systems – Existence and Uniqueness of Solutions to Continuous – Time State Equations – Solutions – Linear Time Invariant Continuous – Time State Equations – State transition matrix and it's properties

UNIT – V

Introduction to optimal control – Formulation of optimal control problems – calculus of variations – fundamental concepts, functional, variation of functional – fundamental theorem of theorem of Calculus of variations – boundary conditions – constrained minimization – formulation using Hamiltonian method – Linear quadratic regulator

REFERENCES

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. Manke: Linear Control System, Khanna Publishers
5. Nagrath and Gopal: Control System Engineering, New Age International Publishers.

FORCED COMMUTATION CIRCUITS

MEPE – 104

UNIT- I

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

UNIT – II

Line commutated inverters, Margin angle, HVDC, Converter reactions on load side and source side. Concepts of three phase to single phase and three phase to three phase cycloconverter. Symmetrical and asymmetrical control. Harmonic analysis of output voltage.

UNIT – III

Single phase cycloconverters- Half controlled and fully controlled Converters – Evaluation of input power factor and harmonic factor-Continuous and Discontinuous load current-Single phase dual converters-Power factor improvements-Extinction angle control-symmetrical angle control-PWM single phase sinusoidal PWM-Single phase series converters-– Application- numerical problems

UNIT – V

Study 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.

REFERENCES

1. Power Electronic Circuits, Devices and Applications - M.H.Rashid–PHI
2. Power Electronics M.D. Singh
3. Edn – Fundamentals of Electric Drives – G. K. Dubey – Narosa Publications – 1995.
4. Hand book of Power Electronics M.H. Rashid

ELECTRICAL DRIVES

MEPE – 105

UNIT- I

Introduction: Electrical drives, drive characteristics. D.C. motor drives: Rectifier fed drives, Chopper controlled drives. Induction motor drives: Equivalent circuits, speed control, slip energy recovery. Synchronous motor drives: Operation with fixed frequency and variable frequency source. Closed-loop control of drives: D.C. motor drives - Armature Voltage control, Field weakening A.C. motors - motor drives with VSI, CSI and Cycloconverter.

UNIT – II

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 – III

Slip power recovery drives-Static Kramer Drive-Phasor diagram-Torque expression-Speed control of Kramer Drive-Static Scheribus Drive- Modes of operation

UNIT – IV

Separately excited DC motors with rectified single phase supply- single phase semi converter and single phase full converter for continuous and discontinuous modes of operation – power and power factor.

UNIT – V

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.

REFERENCES

1 • Dubey G.K. "Power semi Conductor controller drives, Prentice Hall.
Vedam Subramanyam, "Electrical Drives".
2 T.J.E. Miller, Switched Reluctance & P.M. B.L. DC motor, Pergamon Press
3. P.C. Sen, D.C. drive, Pergamon Press.