

MEPS – 301(A)Power System Instrumentation

UNIT 1

Introduction to instrumentation and control of energy systems, display instruments, recorders.

UNIT 2

Transducers, sensors, actuators such as pressure, temperature, velocity, speed, volume, torque and solar flux measuring devices, current, voltage and power factor.

UNIT 3

Gas analysers, power plants and industrial instrumentation and pollution monitoring devices.

UNIT 4

Signal conditioning of inputs, single channel and multichannel data acquisition system, D/A and A/D converters, data loggers, supervisory control.

UNIT 5

Data transmission systems, Advantage and disadvantage of digital transmission over analog. Time division multiplexing, pulse modulation, digital modulation.

Reference Books:

1. Transducers & Instrumentation by D.V.S. Murty – PHI Prentice Hall
2. Electronic Instrumentation by H.S.Kalsi – Tata McGraw Hill
3. Electrical and Electronics Measurement and Instr., A.K.Sawhney, Dhanpat Rai
4. Instrumentation devices and systems by C.S.Rangan and G.R. Sharma, TMH

MEPS – 301(B)DSP & its Application

UNIT 1

Introduction to DSP - Classification of signals, Multichannel and multi dimensional continuous v/s discrete time signals, continuous v/s discrete valued signals, continuous time sinusoidal signal, discrete time sinusoidal signals, sampling of analog signal, sampling theorem, quantification and coding of D/A conversion.

UNIT 2

Discrete Time Signal and Systems - Discrete time signal, systems, Z-transform & Inverse Z-transform, analysis of discrete time, linear time invariant systems, co-relation of discrete time systems.

UNIT 3

Frequency Analysis Of Signals - Frequency analysis of analog signals, frequency analysis of discrete time signals. Properties of Fourier Transform, Frequency Domain Characteristics, Time Frequency Dualities, Sampling of signals in time and frequency domain, DFT & FFT.

UNIT 4

Design Of Digital Filter - Design of linear phase FIR filter using window & frequency sampling method. Design of equiripple linear phase filters. Comparison of design methods for linear phase FIR filters. Design of IIR filters from analog filters. Direct Design Technique for digital IIR filters.

UNIT 5

DSP Application - Introduction to digital signal processors chips, case study of different DSP applications. Application of filters to analog & digital signal processor, FET spectrum analyzer.

Reference Books :

1. Digital Signal Processing - W.D.Stanley
2. Analog & Digital Signal Processing – Ashok Ambardar

MEPS – 301(C)Power Controller

UNIT 1

Various power semiconductor devices i.e. SCR, GTO, MOSFET, BJT, IGBT & MCT's & their protection, series-parallel operation, Heat sink calculations, Design of firing circuit for converters, choppers & inverters.

UNIT 2

Analysis & design of 1- ϕ bridge converter, 3- ϕ bridge converter with and without freewheeling diode, effect of source impedance, power factor improvement techniques, pulse width modulated converters, Dual converters, converter for HVDC application & DC drives.

UNIT 3

Analysis & design of voltage commutated, current commutated and load commutated choppers, multi-quadrant choppers, chopper for traction application. Resonant choppers, SMPS.

UNIT 4

Detailed analysis of 1- ϕ VSI, 3- ϕ VSI (180° mode, 150° mode & 120° mode of conduction), various inverter commutation circuits, harmonic reduction techniques, PWM inverters, Inverters for HVDC application & AC drives.

Advantages & limitation of current source inverters over VSI, 1- ϕ and 3- ϕ CSI. Resonant inverters.

UNIT 5

1- ϕ to 1- ϕ , 3- ϕ to 3- ϕ cycloconverter circuits, circulating current scheme, non-circulating current operation, Mean output voltage, harmonics in supply current waveform & input-power factor. Concept of power quality

Reference Books :

1. Thyristorised Power Controllers - G.K.Dubey, Doradla, Joshi, Sinha
2. Power Electronics - C.W.Lander
3. Power Electronics - Rashid
4. Thyristorised power controlled converters & cycloconverters - B.R.Pelly
5. Power Electronics - N.Mohan

MEPS – 302(A)Special Machines

UNIT 1

Square wave permanent magnet brushless dc motor, magnetic circuit analysis on open circuit torque & emf equations, torque speed characteristics, efficiency, commutation, winding inductances, armature reaction and controllers.

UNIT 2

Sine wave permanent magnet brushless dc motor, torque & emf equation, Inductance of phase winding, synchronous reactance, phasor diagram, torque-speed characteristics.

UNIT 3

Switched reluctance motor, static torque production, partition of energy and the effects of saturation, Dynamic torque production, torque speed characteristics, shaft position sensing, solid rotors.

UNIT 4

Linear Induction Motors, construction, performance, thrust-speed characteristic, application, end effect.

UNIT 5

Stepper motor – variable reluctance stepper motor, single stack stepper motor multistack stepper motor, permanent magnet stepper motor, Important features of stepper motor, torque v/s stepping rate characteristics, Drive circuits, unipolar drive circuits, Bipolar drive circuits.

Reference Books:

1. Brushless Permanent Magnet & Reluctance Motor Drives – T.J.E.Miller
2. Principles of Electric Machines & Power Electronics – P.C.Sen
3. Electric Drives – G.K.Dubey

MEPS – 302(B)Advanced Electrical Drives

UNIT 1

Electrical Drives Introduction, Choice of Electrical Drives, Dynamics of Electrical Drives, Concept of Multi-quadrant operation, Components of load torques. Selection of motor power rating.

UNIT 2

D.C.Drive, speed torque, speed control. Starting, Breaking. Controlled rectified fed DC drive, chopper controlled dc drives. Close loop control of d.c. drive. Introduction of transient analysis.

UNIT 3

Induction Motor Drives : Three phase I.M., analysis and performance. Operation with unbalanced source voltages and single phasing, analysis of I.M. fed from Non-sinusoidal voltage supply. Starting, Breaking, Introduction of transient analysis. Speed control methods, single phase I.M. Close loop control of I.M. Drives.

UNIT 4

Synchronous Motor Drives, cylindrical rotor wound field motor, salient pole wound field motor, synchronous reluctance motor, Hysteresis synchronous motor, operation from fixed frequency

supply, starting, breaking, synchronous motor variable speed drives, starting large synchronous machines.

UNIT 5

Introduction of Brushless dc motor, stepper motor and switch reluctance motor drives, solar and battery powered drives, Traction Drives, Energy conservation in Electrical Drives.

Reference Books:

1. Power semi conductor controlled drives by G.K.Dubey
2. Fundamentals of Electrical Drives by G.K.Dubey
3. Electrical Machine & Power Electronics by P.C.Sen