

MEPE – 301 (A) Micro Controllers and Control

Unit-1

Introduction: Overview of microcontroller 8031, 80196 and latest microcontroller developments architecture of 8051 instructions set. Assembly language programming to 8051 Inside the 8051 introduction to 8051 assembly programming assembling and running of 8051 program data types and directives flag bits and PSW register. Register bank and stack jump loop and call instructions addressing modes.

Unit-2

Program development Program development using arithmetic instruction logical instruction single bit instruction I/O programming interrupts programming timer counter programming.

Unit-3

Microcontroller interfacing

Interfacing to LCD ADC DAC chip stepper motor key board

Unit-4

Introduction overview of DSP and its latest development, architecture, instruction set and applications.

References:

- 1 K.J. Ayala, The 8086 microprocessor : programming and interfacing the PC, Pen ram International.
2. K.J. Ayala, The 8051 microcontroller: Architecture, programming and applications, Pen ram Int.
3. Raj Kamal, The concepts and features of microcontrollers (68H11, 8051 & 8096), Wheeler publishing.
4. Douglas Hall, Microprocessor & Interfacing, TMH
5. 8051 Microcontroller and Embedded System-Maz

MEPE – 301 (B) Power Electronics Supply System and Design

UNIT-1

Review of basic power electronics principles. Introduction to various power electronics supplies. Performance parameters for power electronics supplies and their measurements.

UNIT- 2

DC to DC converters: Analysis and design of buck, boost, buck- boost and cuk converters, two quadrant and full bridge converters. Isolated converters i.e. flyback, forward and bridge topology. Design of d.c. inductor. Concept of integrated magnetics, converter control, average model, state- space model.

UNIT 3

DC controlled AC: Controlled inversion, three phase full wave inverters. 180° mode and 120° mode operation, harmonic analysis, PWM control of VSI, current mode control of PWM VSI, space vector modulation, three phase current sourced PWM CSI, design and simulation.

UNIT- 4

AC Choppers: Modeling and analysis of AC choppers, harmonic control using symmetrical and asymmetrical waveform pattern, design and simulation.

UNIT- 5

Soft switching DC to DC converters, zero current switching topologies, zero voltage switching topologies, generalized switching cell, ZCT and ZVT DC converters, design and simulation.

Reference Books

1. Power Electronics Circuits, Issa Batarseh, John Wiley & Sons Inc., 2004
- 2 Power Electronics: Converters, Applications, and Design, Ned Mohan, John Wiley & Sons Inc., 2001.
3. Power Electronic Systems Theory and Design, Jai P Agrawal, Pearson Education Asia, 2001.
4. Switching Power Supply Design, A I Pressman, McGraw Hill Publication, 1991.
5. Handbook of Power Electronics, M H Rashid

MEPE – 301 (C) Non Conventional Energy Sources and Energy converters

Unit – 1

Renewable Energy Systems: Energy Sources, Comparison of Conventional and non-conventional, renewable and non-renewable sources, statistics of world resources and data on different sources globally and in Indian context, significance of renewable sources and their exploitation energy planning, Energy efficiency and management.

Unit – 2

Wind Energy System Wind Energy, Wind Mills, Grid connected systems, system configuration, working principles, limitations, effects of wind speed and grid conditions. Grid independent systems - wind-battery, wind-diesel, wind-hydro biomass etc. wind operated pumps, controller for energy balance. Small hydro system grid connected system, system configurations, working principles and limitations, effect of hydro potential and grid conditions, synchronous versus induction generators for stand alone systems, use of electronic load controllers and self excited induction generators. Wave Energy Systems: System configuration, grid connected and hybrid systems.

Unit 3

Solar Radiation Extraterrestrial solar radiation, terrestrial solar radiation, Solar thermal conversion, solar photo tonic systems. Solar cell material and efficiency. Characteristic of PV panels under varying insolation. PV operated lighting and water pumps, characteristics of motors and pumps connected to PV panels. Biomass Energy System: System configuration, Biomass engine driven generators, feeding loads in stand-alone or hybrid modes, Biomass energy and their characteristics.

Unit 4

Electric Energy Conservation: Energy efficient motors and other equipment: Energy saving in Power Electronic controlled drives, electricity saving in pumps, air-conditioning, power plants, process industries, illumination etc. methods of Energy Audit measurements systems; efficiency measurements. energy regulation, typical case studies, various measuring devices analog and digital, use of thyristers.

Unit-5

Study of typical energy converters such as high performance motor special generators driven by bio gas engines. Wind turbines etc., mini-hydro generators, modern state of the art and futuristic systems in this area.

References:

1. John Twidell & Toney Weir, Renewable Energy Resources, E & F N Spon.
2. El-Wakil, Power Plant Technology, McGraw Hill.
3. Rai G D, Non-conventional Energy Resources, Khanna.
4. F Howard E. Jordan, "Energy-Efficient Electric Motor & their Application-II", Plenum Press, New York, USA.
5. S.P. Sukhatme: Solar Energy, TMH-4e,

MEPE – 302 (A) Computer Aided Power Electronics Analysis & Design

UNIT- I

Introduction to power electronics simulation, methods of analysis and formulation of system equations.

UNIT- II

Modeling of power electronics system elements, computer formulation of power electronics system equations, review of graph theory.

UNIT- III

Introduction to Spice, Auto sec, Simulink for power electronics converter analysis. Introduction to digital optimization, Sequential methods of simulation.

UNIT- IV

Advance techniques for efficient computation. Creation of data files for power semi-conductors, magnetic and capacitors.

UNIT- V

Modeling of stray inductance, Capacitances and connections, Thermal Modeling and heat flow design. Analysis under abnormal fault conditions and design of protection circuits.

BOOKS:

1. Computer Aided Power Electronics Analysis and design Venkatachari Rajgopal
2. Power Electronics and AC Drives B. K. Bose
3. Power Electronics Control Turnbull JMD Murphy & FG
4. Design of Inductors & Transformers Col. Mc
5. Manufacturers Catalogue on Rectifiers GE,
6. West.code/International/ Ferraz/Prague/Siemens etc.

MEPE – 301 (B) EHV AC and DC Transmission

Unit-I

Constitution of EHV a.c. and d.c. links, Kind of d.c. links, Limitations and Advantages of a.c. and d.c. transmission, Principal application of a.c. and d.c. transmission, Trends in EHV a.c. and d.c. transmission, Power handling capacity. Converter analysis garetz circuit, Firing angle control, Overlapping.

Unit-II

Extra long distance lines, Voltage profile of loaded and unloaded line along the line, Compensation of lines, Series and shunt compensation, Shunt reactors, Tuned power lines. Problems of Extra long compensated lines, FACT concept and application.

Unit-III

Travelling waves on transmission systems, Their shape, Attenuation and distortion, effect of junction and termination on propagation of traveling waves. Over voltages in transmission system. Lightning, switching and temporary over voltages: Control of lighting and switching over voltages.

Unit-IV

Components of EHV d.c. system, converter circuits, rectifier and inverter valves, Reactive power requirements, harmonics generation, Adverse effects, Classification, Remedial measures to suppress, filters, Ground return. Converter faults & protection harmonics misoperation, Commutation failure, Multiterminal D.C. lines.

Unit-V

Control of EHV d.c. system desired features of control, control characteristics, Constant current control, Constant extinction angle control. Ignition Angle control. Parallel operation of HVAC & DC system. Problems & advantages.

Reference Books:

- Begmudre, EHV AC Transmission.
- S. Rao, EHV AC & DC Transmission.
- Kimbark, HVDC Transmission.
- Arrillaga, HVDC Transmission.
- Padiyar, HVDC Transmission.