ACADEMIC REGULATIONS

COURSE STRUCTURE

AND

DETAILED SYLLABUS

FOR

M. Tech. (POWER ELECTRONICS)

(with effect from 2013-2014)

MTPE 11 MACHINE MODELLING AND ANALYSIS

Class: M.Tech. I Semester **Lectures: 4**
Branch: EEE (Power Electronics) **University Examination: 100 Marks**
Duration of University Examination: 3 Hours **Sessionals: 50 Marks**

Course Objectives:

The students will be able to:
1. Understand the concept of 2-axis representation of an Electrical machine.
2. Know the concepts of representing transfer function model of a DC machine.
3. Understand the importance of 3-phase to 2-phase conversion.
4. Know the representation of 3-phase induction motor in various reference frames
5. Know the modeling of 3-phase synch. Motor in 2- axis representation.

UNIT – I

Basic Two-pole DC machine - primitive 2-axis machine - Voltage and Current relationship - Torque equation

UNIT – II

Mathematical model of separately excited DC motor and DC Series motor in state variable form - Transfer function of the motor - Numerical problems. Mathematical model of D.C. shunt motor and D.C. Compound motor in state variable form - Transfer function of the motor - Numerical Problems.

UNIT – III

Linear transformation - Phase transformation (a, b, c to α, β, o) - Active transformation(α, β, o to d, q). Circuit model of a 3 phase Induction motor – Linear transformation - Phase Transformation - Transformation to a Reference frame - Two axis models for Induction motor.

UNIT – IV

Voltage and current Equations in stator reference frame - Equation in Rotor reference frame - Equations in a synchronously rotating frame - Torque equation-Equations in state-space form.

UNIT – V

Circuit model of a 3ph Synchronous motor - Two axis representation of Syn. Motor Voltage and current Equations in state - space variable form - Torque equation.

TEXT BOOKS :
1. Thyristor control of Electric Drives - Vedam Subramanyam.
2. Analysis of electric machinery and Drive systems - Paul C.Krause , Oleg wasynezuk, Scott D.Sudhoff

MTPE 12 ANALYSES OF POWER ELECTRONIC CONVERTERS

Class: M.Tech. I Semester **Lectures: 4**
Branch: EEE (Power Electronics) **University Examination: 100 Marks**
Duration of University Examination: 3 Hours **Sessionals: 50 Marks**

Course Objectives:
The students will be able to:
1. To analyze the performance of controlled
2. To understand designing concepts of AC-AC voltage controllers and Cycloconverters.
3. To learn the designing of DC-DC chopper circuits.
4. To understand and analyze PWM techniques for Inverters.

UNIT – I

Single Phase AC Voltage Controllers: Single phase AC voltage controllers with Resistive, Resistive-inductive and Resistive-inductive-induced e.m.f. loads - ac voltage controllers with PW Control - Effects of source and load inductances - Synchronous tap changers-Applications - numerical problems.

UNIT – II

Three Phase AC Voltage Controllers: Three phase AC voltage controllers - Analysis of controllers with star and delta Connected Resistive, Resistive-inductive loads - Effects of source and load Inductances - applications - numerical problems.
Cycloconverters. Single phase to single phase cycloconverters - analysis of midpoint and bridge Configurations - Three phase to three phase cycloconverters - analysis of Midpoint and bridge configurations - Limitations - Advantages - Applications- numerical problems.

UNIT – III

Single Phase Converters: Single phase converters - 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 - Applications -Numerical problems.
Three Phase Converters. Three phase converters - Half controlled and fully controlled converters -Evaluation of input power factor and harmonic factor - continuous and Discontinuous load current - three phase dual converters - power factor Improvements - three phase PWM - twelve pulse converters - applications -Numerical problems.

UNIT – IV

D.C. to D.C. Converters: Analysis of step-down and step-up dc to dc converters with resistive and Resistive-inductive loads - Switched mode regulators - Analysis of Buck Regulators - Boost regulators - buck and boost regulators - Cuk regulators - Condition for continuous inductor current and capacitor voltage - comparison of regulators -Multiouput boost converters - advantages - applications - Numerical problems.

UNIT – V

Pulse Width Modulated Inverters(single phase):
Principle of operation - performance parameters - single phase bridge inverter -evaluation of output voltage and current with resistive, inductive and Capacitive loads - Voltage control of single phase inverters - single PWM - Multiple PWM - sinusoidal PWM - modified PWM - phase displacement Control - Advanced modulation techniques for improved performance - Trapezoidal, staircase, stepped, harmonic injection and delta modulation - Advantage - application - numerical problems.

Pulse Width Modulated Inverters(three phase). Three phase inverters - analysis of 180 degree condition for output voltage And current with resistive, inductive loads - analysis of 120 degree Conduction - voltage control of three phase inverters - sinusoidal PWM - Third Harmonic PWM – 60 degree PWM – space vector modulation - Comparison of PWM techniques - harmonic reductions - Current Source Inverter - variable d.c. link inverter - boost inverter - buck and boost inverter - inverter circuit design - advantages -applications - numerical problems.

TEXT BOOKS:

1. Power Electronics - Mohammed H. Rashid - Pearson Education -Third Edition - First Indian reprint 2004.
2. Power Electronics - Ned Mohan, Tore M. Undeland and William P. Robbins -John Wiley and Sons - Second Edition.

MTPE 13 MODERN CONTROL THEORY

Class: M.Tech. I Semester **Lectures: 4**
Branch: EEE (Power Electronics) **University Examination: 100 Marks**
Duration of University Examination: 3 Hours **Sessionals: 50 Marks**

Course Objectives:
The students will be able to:
1. Know the basic concepts of matrices, Eigen values and Eigen vectors.
2. Know the modeling of systems by using state space Analysis
3. Know the design of controllers for several classes of plants.
4. Know the Harmonic Analysis and Stability of Non- Linear Systems
5. Know the control problems such as dead bent control, external Disturbances and sensitivity problems in optimal linear regulators.

UNIT – I

Fields, Vectors and Vector Spaces – Linear combinations and Bases – Linear Transformations and Matrices – Scalar Product and Norms – Eigen values, Eigen Vectors and a Canonical form representation of Linear operators – The concept of state – State Equations for Dynamic systems – Time invariance and Linearity – Nonuniqueness of state model – State diagrams for Continuous-Time State models .

UNIT – II

STATE VARIABLE ANALYSIS: Linear Continuous time models for Physical systems– Existence and Uniqueness of Solutions to Continuous-Time State Equations – Solutions of Linear Time Invariant Continuous-Time State Equations – State transition matrix and it's properties.

CONTROLLABILITY AND OBSERVABILITY
General concept of controllability – General concept of Observability – Controllability tests for Continuous-Time Invariant Systems – Observability tests for Continuous-Time Invariant Systems – Controllability and Observability of State Model in Jordan Canonical form – Controllability and Observability Canonical forms of State model.

UNIT – III

NON LINEAR SYSTEMS: Introduction – Non Linear Systems - Types of Non-Linearities – Saturation – Dead-Zone - Backlash – Jump Phenomenon etc;– Singular Points – Introduction to Linearization of nonlinear systems, Properties of Non-Linear systems – Describing function– describing function analysis of nonlinear systems – Stability analysis of Non-Linear systems through describing functions

NON LINEAR SYSTEMS -II
Introduction to phase-plane analysis, Method of Isoclines for Constructing Trajectories, singular points, phase-plane analysis of nonlinear control systems.

UNIT – IV

STABILITY ANALYSIS: Stability in the sense of Lyapunov, Lyapunov's stability and Lypanov's instability theorems - Stability Analysis of the Linear continuous time invariant systems by Lyapunov second method – Generation of Lyapunov functions – Variable gradient method – Krasooviski's method.

STATE FEEDBACK CONTROLLERS AND OBSERVERS
State feedback controller design through Pole Assignment – State observers: Full order and Reduced order

UNIT – V

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

TEXT BOOKS:

1. Modern Control System Theory by M.Gopal – New Age International -1984.
2. Modern Control Engineering by Ogata.K – Prentice Hall - 1997

REFERENCE BOOKS:

Optimal control by Kircks

MTPE 14 POWER ELECTRONIC CONTROL OF DC DRIVES

Class: M.Tech. I Semester **Lectures: 4**
Branch: EEE (Power Electronics) **University Examination: 100 Marks**
Duration of University Examination: 3 Hours **Sessionals: 50 Marks**

Course Objectives:
The students will be able to:
1. Design motor starting, braking and reversing electrical circuits.
2. Control Speed of the DC motor by using different controllers.
3. Design and modeling of current and speed controllers for DC motors
4. Determine drive system stability by calculating different system parameters.
5. Calculate harmonics and their associated problems.

UNIT – I

Controlled Bridge Rectifier (1-Φ) with DC Motor Load: Separately exited 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 – II

Controlled Bridge Rectifier (3-Φ) with DC Motor Load: Three-phase semi converter and three phase full converter for continuous and discontinuous modes of operation – power and power factor – Addition of free wheeling diode- Three-phase double converter.

Three phase naturally commutated bridge circuit as a rectifier or as an inverter:
Three phase controlled bridge rectifier with passive load impedance, resistive load and ideal supply – Highly inductive load and ideal supply for load side and supply side quantities, shunt capacitor compensation, three phase controlled bridge rectifier inverter.

UNIT – III

Phase controlled DC Motor drives: Three phase controlled converter, control circuit, control modeling of three phase converter – Steady state analysis of three phase converter control DC motor drive – Two quadrant, three phase converter controlled DC motor dive – DC motor and load converter.

Current and Speed Controlled DC Motor drives:
Current and speed controllers – current and speed feedback – Design of controllers – current and speed controllers – Motor equations – filter in the speed feed back loop speed controller – current reference generator – current controller and flow chart for simulation – Harmonics and associated problems – sixth harmonics torque.

UNIT – IV

Chopper controlled DC Motor drives
Principles of operation of the chopper – four-quadrant chopper circuit – chopper for inversion – Chopper with other power devices – model of the chopper –input to the chopper steady state analysis of chopper controlled DC motor drives – rating of the devices – Pulsating torque.

Closed loop operation of DC Motor drives
Speed controlled drive system – current control loop – pulse width modulated current controller – hysterisis current controller – modeling of current controller – design of current controller.

UNIT – V

Simulation of DC motor drives : Dynamic simulations of the speed controlled DC motor drives – Speed feedback speed controller – command current generator – current controller.

REFERENCES:

1. Power Electronic and motor control – Shepherd, Hulley, Liang – II Edition, Cambridge University Press.
2. Electronic Motor drives modeling, Analysis and control – R. Krishnan – I Edition, Prentice Hall India.
3. Power Electronic circuits, Drives and Applications – M. H. Rashid – PHI – I Edition – 1995
4. Fundamentals of Electric Drives – G.K. Dubey – Narosa Publications – 1995
5. Power Semiconductor drives – S.B. Dewan and A. Straughen -1975

MTPE 15A HIGH VOLTAGE DC TRANSMISSION
(Elective-I)

Class: M.Tech. I Semester **Lectures: 4**
Branch: EEE (Power Electronics) **University Examination: 100 Marks**
Duration of University Examination: 3 Hours **Sessionals: 50 Marks**

Course Objectives:
The students will be able to:
1. Learn the importance of HVDC transmission.
2. Analyze HVDC converters
3. Know the faults and protections required in HVDC system
4. Get idea of Harmonics and Filters
5. Know the concepts of multiterminal DC links.

UNIT – I

H.V.D.C. Transmission: General considerations, Power Handling Capabilities of HVDC Lines, Basic Conversion principles, static converter configuration.

UNIT – II

Static Power Converters: 3-pulse, 6-pu!se and 12-pulse converters, converter station and Terminal equipment, commutation process, Rectifier and inverter operation, equivalent circuit for converter -special features of converter transformers. Harmonics in HVDC Systems, Harmonic elimination, AC and DC filters.

UNIT – III

Control of HVDC Converters and systems: constant current, constant extinction angle and constant Ignition angle control- Individual phase control and equidistant firing angle control, DC power flow control. Interaction between MV AC and DC systems - Voltage interaction, Harmonic instability problems and DC power modulation.

UNIT – IV

Multi-terminal DC links and systems; series, parallel and series parallel systems, their operation and control. Transient over voltages in HVDC systems: Over voltages due to disturbances on DC side, over voltages due to DC and AC side line faults.

UNIT – V

Converter faults and protection in HVDC Systems: Converter faults, over current protection - valve group, and DC line protection. Over voltage protection of converters, surge arresters.

REFERENCE BOOKS:

1. E.W. Kimbark : Direct current Transmission, Wiely Inter Science - New York.
2. J.AriMaga : H/V.D.C. Transmission Peter Peregrinus ltd., London UK 1983
3. K_.R.Padiyar: High Voltage Direct current Transmission, Wiely Eastern Ltd,, New Delhi – 1992.
4. E.Uhlman : Power Transmission by Direct Current, Springer Verlag, Berlin Helberg -1985

MTPE 15B OPERATIONS RESEARCH
(Elective-I)

Class: M.Tech. I Semester **Lectures: 4**
Branch: EEE (Power Electronics) **University Examination: 100 Marks**
Duration of University Examination: 3 Hours **Sessionals: 50 Marks**

Course Objectives:
The students will be able to:
1. Know the concepts of linear programming
2. Understand the formulation and solve assignment and sequencing problems.
3. Learn dynamic programming techniques.
4. Learn the methods of non-linear optimization.

UNIT – I

Linear Programming Problem: Formulation – Graphical method - Simplex method – Artificial variable techniques – Big-M tune –phase methods.
Duality theorem – Dual simplex method – Sensitivity analysis - effect of changes in cost coefficients, Constraint constants, Addition/Deletion of variables and constraints

UNIT – II

Transportation problem – formulation – Initial basic feasible solution methods – Northwest, Least cost and Vogels methods, MODI optimization - Unbalanced and degeneracy treatment Assignment problem – Formulation – Hungarian method – Variants of assignment problems, Sequencing problems – Flow shop sequencing – n jobs X 2 machines sequencing - n jobs X 3 machines sequencing – Job-shop sequencing – 2 jobs X m machines sequencing – Graphical methods

UNIT – III

Game Theory - Introduction - Terminology – Saddle point games - with out Saddle point games - 2 X 2 games, analytical method - 2 X n and m X 2 games – graphical method – dominance principle Dynamic programming – Bellman's principle of optimality – short route – capital investment – inventory allocation

UNIT – IV

Non linear optimization – Single variable optimization problem – Unimodal function - Elimination methods – Fibinocci and Golden reaction methods – Interpolation methods - Quadratic and cubic interpotation method.
Multi variable optimization problem – Direct research methods – Univariant method – Pattern search methods – Powell's , Hook-Jeaves and Rosen-brock's search method.

UNIT – V

Geometric programming – Polynomial – Arithmetic – Seametric inequality – Unconstrained G.P – Constraint G.P with □ type constraint
Simulation: Definition – Types- steps- Simulation of simple electrical systems – Advantages and Disadvantages

TEXT BOOKS:

1. Optimization theory and Applications – S.S.Rao, New Age Internationals
2. Operations Research - S.D.Sharma, Galgotia publishers
3. Operations Research – Kausur and Kumar, Spinger Publishers

REFERENCES:

1. Optimization techniques: Theory and Practice – M.C.Joshi and K.M. More Ugalya, Narosa Publications
2. Optimization : Theory and Practice – Beweridze, Mc Graw Hill
3. Simulation Modelling and Analysis – Law and Kelton –TMH
4. Optimization Concepts and Applications in Engineering- A.D. Belegundu, J.R. Chandrupata, Pearson Education, Asia

MTPE 15C MODERN POWER ELECTRONICS
(Elective-I)

Class: M.Tech. I Semester **Lectures: 4**
Branch: EEE (Power Electronics) **University Examination: 100 Marks**
Duration of University Examination: 3 Hours **Sessionals: 50 Marks**

Course Objectives:

The students will be able to:

1. To learn the characteristics of modern power semiconductor devices.
2. To understand the operation of resonant converters.
3. To analyze the performance of different topologies of Multilevel Inverters.
4. To learn the concepts of DC power supplies.

UNIT – I

Modern power semiconductor devices: Modern power semiconductor devices – MOS turn Off Thyristor (MTO) – Emitter Turn Off Thyristor (ETO) – Integrated Gate-Commutated thyristor (IGCTs) – MOS-controlled thyristors (MCTs) – Static Induction circuit – comparison of their features.

UNIT – II

Resonant Pulse Inverters: Resonant pulse inverters – series resonant inverters – series resonant inverters with unidirectional switches – series resonant inverters with bidirectional Switches – analysis of half bridge resonant inverter - evaluation of currents and Voltages of a simple resonant inverter – analysis of half bridge and full bridge resonant inverter with bidirectional switches – Frequency response of series resonant inverters – for series loaded inverter – for parallel loaded inverter – For series and parallel loaded inverters – parallel resonant inverters – Voltage control of resonant inverters – class E inverter and Class E rectifier – numerical problems.

Resonant converters: Resonant converters – Zero current switching resonant converters – L type ZCS resonant converter – M type ZCS resonant converter – zero voltage Switching resonant converters – comparison between ZCS and ZVS resonant Converters – Two quadrant ZVS resonant converters – resonant de-link Inverters – evaluation of L and C for a zero current switching inverter – Numerical problems.

UNIT – III

Multilevel Inverters: Multilevel concept – Classification of multilevel inverters – Diode clamped multilevel inverter – principle of operation – main features – improved diode Clamped inverter – principle of operation – Flying capacitors multilevel inverter – principle of operation – main features.

Multilevel Inverters (continued)

Cascaded multilevel inverter – principle of operation – main features – Multilevel inverter applications – reactive power compensation – back to back intertie system – adjustable drives – Switching device currents – de link capacitor voltage balancing – features of Multilevel inverters – comparisons of multilevel converters.

UNIT – IV

DC Power Supplies: DC power supplies – classification – switched mode dc power supplies – fly back Converter – forward converter – push-pull converter – half bridge converter – Full bridge converter – Resonant dc power supplies – bidirectional power supplies – Applications.

UNIT – V

AC Power Supplies : AC power supplies – classification – switched mode ac power supplies – Resonant AC power supplies – bidirectional ac power supplies – multistage conversions – control circuits – applications. **Power Conditioners and Uninterruptible Power Supplies:** Introduction – power line disturbances – power conditioners – uninterruptible Power supplies – applications.

TEXT BOOKS:

1. Power Electronics – Mohammed H. Rashid – Pearson Education – Third Edition
2. Power Electronics – Ned Mohan, Tore M. Undeland and William P. Robbins – John Wiley and Sons – Second Edition.

MTPE 16A PROGRAMMABLE LOGIC CONTROLLERS AND THEIR APPLICATIONS
(Elective-II)

Class: M.Tech. I Semester **Lectures: 4**
Branch: EEE (Power Electronics) **University Examination: 100 Marks**
Duration of University Examination: 3 Hours **Sessionals: 50 Marks**

Course Objectives:
The students will be able to:
1. Understand the concept of ladder programming.
2. Know the PLC programming for several Digital Logic Circuits.
3. Know the applications of PLC in industries.
4. Learn the operation of analog PLC.

UNIT – I

PLC Basics: PLC system, I/O modules and interfacing, CPU processor, programming equipment, programming formats, construction of PLC ladder diagrams, devices connected to I/O modules.

UNIT – II

PLC Programming: Input instructions, outputs, operational procedures, programming examples using contacts and coils. Drill press operation.
Digital logic gates, programming in the Boolean algebra system, conversion examples. Ladder diagrams for process control: Ladder diagrams and sequence listings, ladder diagram construction and flow chart for spray process system.

UNIT – III

PLC Registers: Characteristics of Registers, module addressing, holding registers, input registers, output registers.
PLC Functions: Timer functions and Industrial applications, counters, counter function industrial applications, Arithmetic functions, Number comparison functions, number conversion functions.

UNIT – IV

Data Handling functions: SKIP, Master control Relay, Jump, Move, FIFO, FAL, ONS, CLR and Sweep functions and their applications.
Bit Pattern and changing a bit shift register, sequence functions and applications, controlling of two axis and three axis Robots with PLC, Matrix functions.

UNIT – V

Analog PLC operation: Analog modules and systems, Analog signal processing, multi bit data processing, analog output application examples, PID principles, position indicator with PID control, PID modules, PID tuning, PID functions.

REFERENCE BOOKS:
1. Programmable Logic Controllers – Principle and Applications by John W. Webb and Ronald A. Reiss, Fifth Edition, PHI
2. Programmable Logic Controllers – Programming Method and Applications by JR. Hackworth and F.D Hackworth Jr. – Pearson, 2004.

MTPE 16B ENERGY CONSERVATION SYSTEMS
(Elective-II)

Class: M.Tech. I Semester **Lectures: 4**
Branch: EEE (Power Electronics) **University Examination: 100 Marks**
Duration of University Examination: 3 Hours **Sessionals: 50 Marks**

Course Objectives:
The students will be able to:
1. Know the characteristics and performance of solar cells.
2. Learn the principles of wind energy conversion
3. Know the energy conversion system through coal gasification, biomass and geothermal.
4. Learn the concepts of fuel cells and operation of batteries.

UNIT – I

Photo voltaic power generation ,spectral distribution of energy in solar radiation, solar cell configurations, voltage developed by solar cell, photo current and load current, practical solar cell performance, commercial photo voltaic systems, test specifications for pv systems, applications of super conducting materials in electrical equipment systems.

UNIT – II

Principles of MHD power generation, ideal MHD generator performance, practical MHD generator, MHD technology. Wind Energy conversion: Power from wind, properties of air and wind, types of wind Turbines, operating characteristics.

UNIT – III

Tides and tidal power stations, Modes of operation , tidal project examples, turbines and generators for Tidal power generation. Wave energy conversion: properties of waves and Power content, vertex motion of Waves, device applications. Types of Ocean thermal energy conversion systems Application of OTEC systems Examples, micro hydel developments.

UNIT – IV

Miscellaneous energy conversion systems: coal gasification and liquefaction, biomass conversion, geothermal energy, thermo electric energy conversion, principles of EMF generation, description of fuel cells. Co-generation and energy storage, combined cycle co-generation, energy storage. Global energy position and environmental effects: energy units, global energy position.. Environmental effects energy units, global energy position.

UNIT – V

Types of fuel cells, H2 – O2 Fuel cells, Application of fuel cells – Batteries, Description of batteries, Battery application for large power.
Environmental effects of energy conversion systems, pollution from coal and preventive measures steam stations and pollution, pollution free energy systems.

TEXT BOOK
1. “Energy conversion systems” by Rakosh das Begamudre, New age international publishers, New Delhi - 2000.
2. “Renewable Energy Resources” by John Twidell and Tony Weir, 2^{nd} edition, Fspon & Co

MTPE 16C DYNAMICS OF ELECTRICAL MACHINES
(Elective-II)

Class: M.Tech. I Semester **Lectures: 4**
Branch: EEE (Power Electronics) **University Examination: 100 Marks**
Duration of University Examination: 3 Hours **Sessionals: 50 Marks**

Course Objectives:
The students will be able to:
1. Learn various design and characteristics of electrical machines.
2. The electromechanical analogy of the electrical machines
3. The dynamics characteristics of DC machine with generalized machine theory.
4. Know and study the operation and dynamics characteristics of the induction motor.
5. The dynamic, Transient and steady state characteristics of synchronous machines.

UNIT – I

Basic Machine Theory: Electromechanical Analogy – Magnetic Saturation – Rotating field theory – Operation of Inductor motor – equivalent circuit – Steady state equations of d.c. machines – operations of synchronous motor – Power angle characteristics

UNIT – II

Electrodynamical equation and their solutions: Spring and Plunger system - Rotational motion – mutually coupled coils – Lagrange's equation – Application of Lagrange's equation solution of Electro dynamical equations.

UNIT – III

Dynamics of DC Machines: Separately excited d. c. generations – stead state analysis – transient analysis – Separately excited d. c. motors – stead state analysis – transient analysis – interconnection of machines – Ward Leonard system of speed control.

UNIT – IV

Induction Machine Dynamics: Induction machine dynamics during starting and braking – accelerating time – induction machine dynamic during normal operation – Equation for dynamical response of the induction motor.

UNIT – V

Synchronous Machine Dynamics: Electromechanical equation – motor operation – generator operation – small oscillations – general equations for small oscillations – representation of the oscillation equations in state variable form.

REFERENCE BOOKS:

1. Sen Gupta D.P. and J.W **"** Electrical Machine Dynamics**"**Macmillan Press Ltd 1980.
2. Bimbhra P.S. "Generalized Theory of Electrical Machines " Khanna Publishers 2002.

MTPE 17 POWER CONVERTERS LAB

Class: M.Tech. I Semester **Lectures: 4**
Branch: EEE (Power Electronics) **University Examination: 100 Marks**
Duration of University Examination: 3 Hours **Sessionals: 50 Marks**

Course Objectives:
The students will be able to:
1. Understand the advantages of closed loop control of electrical machines.
2. Know the control techniques for two and four quadrant operations of DC drives.
3. Know the speed control methods of induction motor.
4. Know the application of power electronic converters voltage control.

1. Speed Measurement and closed loop control using PMDC motor
2. Thyristorised drive for PMDC Motor with speed measurement and closed loop control.
3. IGBT used single 4 quadrant chopper drive for PMDC motor with speed measurement and closed loop control.
4. Thyristorised drive for 1Hp DC motor with closed loop control.
5. 3 Phase input, thyristorised drive, 3 Hp DC motor with closed loop
6. 3 Phase input IGBT, 4 quadrant chopper drive for DC motor with closed loop control equipment.
7. Cycloconverter based AC Induction motor control equipment.
8. Speed control of 3 phase wound rotor Induction motor.
9. Single phase fully controlled converter with inductive load
10. Single phase half wave controlled converter with inductive load.

MTPE 18 SEMINAR

Class: M.Tech. I Semester **Sessionals: 100 Marks**
Branch: EEE (Power Electronics)

The candidate should give an oral presentation before the Departmental Post-Graduate Review Committee (DPGRC) on any selected topic relevant to their specialization.

The students will submit a brief report as per specified format and present before the evaluation committee.

The seminar evaluation will be based on the day to day work report submission and presentation before the evaluation committee.

MTPE 21 POWER ELECTRONIC CONTROL OF A.C. DRIVES

Class: M.Tech. II Semester **Lectures: 4**
Branch: EEE (Power Electronics) **University Examination: 100 Marks**
Duration of University Examination: 3 Hours **Sessionals: 50 Marks**

Course Objectives:
The students will be able to:
1. Draw torque speed characteristics for different control parameters by their equivalent circuit analysis.
2. Know different slip recovery drive schemes for speed control of I.M. at rotor side.
3. Study Victor control of Induction Motor Drive.
4. Study and draw characteristics of synchronous motor using UPF and constant flux linkage control.
5. Speed Control of variable Reluctance motor drive and brushless DC motor drive.

UNIT – I

Introduction to AC Drives: Introduction to motor drives – Torque production – Equivalent circuit analysis – Speed – Torque Characteristics with variable voltage operation Variable frequency operation constant v/t operation – Variable stator current operation – Induction motor characteristics in constant torque and field weakening regions.

UNIT – II

Control of Induction motor drives at Stator side Scalar control – Voltage fed inverter control – Open loop volts/Hz control – speed control slip regulation – speed control with torque and flux control – current controlled voltage fed inverter drive – current – fed inverter control – Independent current and frequency control – Speed and flux control in Current –Fed inverter drive – Volts/Hz control of Current –fed inverter drive – Efficiency optimization control by flux program.

UNIT – III

Control of Induction Motor Drive at Rotor Side and Vector Control Slip power recovery drives – Static Kramer Drive – Phasor diagram – Torque expression – speed control of a Kramer Drive – Static Scherbius Drive – modes of operation. **Vector control of Induction Motor Drives:** Principles of Vector control – Vector control methods – Direct methods of vector control – Indirect methods of vector control – Adaptive control principles – Self tuning regulator Model referencing control.

UNIT – IV

Control of Synchronous motor drives: Synchronous motor and its characteristics – Control strategies – Constant torque angle control – Unity power factor control – Constant mutual flux linkage control. **Controllers:** Flux weakening operation – Maximum speed – Direct flux weakening algorithm – Constant Torque mode controller – Flux Weakening controller – indirect flux weakening – Maximum permissible torque – speed control scheme – Implementation strategy speed controller design.

UNIT – V

Variable Reluctance and Brushless DC Motor drives: Variable Reluctance motor drive – Torque production in the variable reluctance motor Drive characteristics and control principles – Current control variable reluctance motor service drive.

Brushless DC Motor drives: Three phase full wave Brushless dc motor – Sinusoidal type of Brushless dc motor- current controlled Brushless dc motor Servo drive

REFERENCES:

1. Electric Motor Drives Pearson Modeling, Analysis and control – R. Krishnan – Publications – 1st edition – 2002.
2. Modern Power Electronics and AC Drives B K Bose – Pearson Publications 1st edition
3. Power Electronics and Control of AC Motors – MD Murthy and FG Turn Bull pergman Press (For Chapters II, III, V) 1st edition
4. Power Electronics and AC Drives – BK Bose – Prentice Hall Eagle wood diffs New Jersey (for chapters I, II, IV) - 1st edition
5. Power Electronic circuits Deices and Applications – M H Rashid – PHI – 1995.
6. Fundamentals of Electrical Drives – G.K. Dubey – Narora publications – 1995 (for chapter II)
7. Power Electronics and Variable frequency drives – BK Bose – IEEE Press – Standard publications - 1st edition – 2002.

MTPE 22 MICROPROCESSORS AND MICROCONTROLLERS

Class: M.Tech. II Semester **Lectures: 4**
Branch: EEE (Power Electronics) **University Examination: 100 Marks**
Duration of University Examination: 3 Hours **Sessionals: 50 Marks**

Course Objectives:
The students will be able to:
1. Learn importance of microprocessors and microcontrollers.
2. Learn and understand architecture and programming of 8086 processor
3. Learn and understand interfacing techniques like memory and I/O interfacing
4. Learn the various data transfer techniques like programmed I/O, interrupt I/O and direct memory access.
5. Learn and understand architecture of advanced processors.

UNIT – I

8086/8088 processors: Introduction to 8086 Microprocessors,Architecture, Addressing modes, Instruction set, Register Organization, Assembler directives.

UNIT – II

Hard ware description: Pin diagram signal description of min & max modes, bus timing, ready & wait states, 8086 based micro computing system. Special features & Related Programming: Stack structure of 8086, Memory segmentation, Interrupts, ISR, NMI, MI and interrupt Programming, Macros.

UNIT – III

Advanced Microprocessors: Intel 80386 programming model , memory paging, Introduction to 80486, Introduction to Pentium Microprocessors and special Pentium pro features. Basic peripherals & Their Interfacing:-Memory Interfacing (DRAM) PPI- Modes of operation of 8255, interfacing to ADC & DAC.

UNIT – IV

Special Purpose of Programmable Peripheral Devices and Their interfacing:-Programmable interval timer, 8253, PIC 8259A,display controller Programmable communication Interface 8251,USART and Exercises.

UNIT – V

Microcontrollers: Introduction to Intel 8-bit &16-bit Microcontrollers, 8051- Architecture, Memory organization, Addressing Modes and exercises. Hardware description of 8051: Instruction formats Instruction sets, interrupt Structure & interrupt priorities, Port structures &Operation linear counter Functions different Modes of Operation and Programming examples.

TEXT BOOKS:
1. The Intel Microprocessors, Architecture Programming & Interfacing by Barry B Brey
2. Advanceed Microprocessors by Kenrith J Ayala, Thomson publishers
3. Microcontrollers by Kentrith J Ayala, Thomson publishers

REFERENCE BOOKS:
1. Microprocessors & Interfacing Programming & Hard ware by Douglas V. Hall
2. Microprocessors & Microcontrollers by Prof. C.R. Sarma

MTPE 23 FLEXIBLE A.C. TRANSMISSION SYSTEMS

Class: M.Tech. II Semester **Lectures: 4**
Branch: EEE (Power Electronics) **University Examination: 100 Marks**
Duration of University Examination: 3 Hours **Sessionals: 50 Marks**

Course Objectives:
The students will be able to:
1. Learn the power flow in transmission system concepts.
2 Understand the operations of application voltage source converters
3. Learn the Objectives of shunt & Series compensation
4. Analyze the behavior of various FACTS devices

UNIT – I

FACTS Concepts: Transmission interconnections power flow in an AC system, loading capability limits, Dynamic stability considerations, importance of controllable parameters basic types of FACTS controllers, benefits from FACTS controllers.

UNIT – II

Voltage Source Converters: Single phase three phase full wave bridge converters transformer connections for 12 pulse 24 and 48 pulse operation. Three level voltage source converter, pulse width modulation converter, basic concept of current source Converters, comparison of current source converters with voltage source converters.

UNIT – III

Static Shunt Compensation: Objectives of shunt compensation, mid point voltage regulation, voltage instability prevention, improvement of transient stability, Power oscillation damping, Methods of controllable var generation, variable impedance type static var generators switching converter type var generators hybrid var generators.

UNIT – IV

SVC and STATCOM: Regulation and slope transfer function and dynamic performance, transient stability enhancement and power oscillation damping operating point control and summary of compensator control.

UNIT – V

Static Series Compensators: Concept of series capacitive compensation, improvement of transient stability, power oscillation damping Functional requirements. GTO thyristor controlled series capacitor (GSC), thyristor switched series capacitor (TSSC), and thyristor controlled series capacitor (TCSC) control schemes for GSC TSSC and TCSC.

TEXT BOOK:

1. “Understanding FACTS Devices”, N.G. Hingorani and L. Gyugi, IEEE Press Publications 2000.

MTPE 24 NEURAL AND FUZZY SYSTEMS

Class: M.Tech. II Semester **Lectures: 4**
Branch: EEE (Power Electronics) **University Examination: 100 Marks**
Duration of University Examination: 3 Hours **Sessionals: 50 Marks**

Course Objectives:

The students will be able to:

1. Understand properties & compositions of neural networks and learning process.
2. Understand methods of minimization like LMS algorithm, back propagation algorithms, single & multi layer perceptrons, self organized maps.
3. Learn the use of Fuzzy logic and fuzzy system implementation
4. Learn and understand associate memories.

UNIT – I

Introduction to Neural Networks Introduction, Humans and Computers, Organization of the Brain, Biological Neuron, Biological and Artificial Neuron Models, Hodgkin-Huxley Neuron Model, Integrate-and-Fire Neuron Model, Spiking Neuron Model, Characteristics of ANN, McCulloch-Pitts Model, Historical Developments, Potential Applications of ANN.

UNIT – II

Essentials of Artificial Neural Networks Artificial Neuron Model, Operations of Artificial Neuron, Types of Neuron Activation Function, ANN Architectures, Classification Taxonomy of ANN – Connectivity, Neural Dynamics (Activation and Synaptic), Learning Strategy (Supervised, Unsupervised, Reinforcement), Learning Rules, Types of Application. **Feed Forward Neural Networks:** Introduction, Perceptron Models: Discrete, Continuous and Multi-Category, Training Algorithms: Discrete and Continuous Perceptron Networks, Perceptron Convergence theorem, Limitations of the Perceptron Model, Applications.

UNIT – III

Multilayer Feed forward Neural Networks Credit Assignment Problem, Generalized Delta Rule, Derivation of Backpropagation (BP) Training, Summary of Backpropagation Algorithm, Kolmogorov Theorem, Learning Difficulties and Improvements. **Associative Memories:** Paradigms of Associative Memory, Pattern Mathematics, Hebbian Learning, General Concepts of Associative Memory (Associative Matrix, Association Rules, Hamming Distance, The Linear Associator, Matrix Memories, Content Addressable Memory), Bidirectional Associative Memory (BAM) Architecture, BAM Training Algorithms: Storage and Recall Algorithm, BAM Energy Function, Proof of BAM Stability Theorem Architecture of Hopfield Network: Discrete and Continuous versions, Storage and Recall Algorithm, Stability Analysis, Capacity of the Hopfield Network.

UNIT – IV

Self-Organizing Maps (SOM) and Adaptive Resonance Theory (ART) Introduction, Competitive Learning, Vector Quantization, Self-Organized Learning Networks, Kohonen Networks, Training Algorithms, Linear Vector Quantization, Stability-Plasticity Dilemma, Feed forward competition, Feedback Competition, Instar, Outstar, ART1, ART2, Applications. **Classical & Fuzzy Sets:** Introduction to classical sets - properties, Operations and relations; Fuzzy sets, Membership, Uncertainty, Operations, properties, fuzzy relations, cardinalities, membership functions.

UNIT – V

Fuzzy Logic System Components and Applications Fuzzification, Membership value assignment, development of rule base and decision making system, Defuzzification to crisp sets, Defuzzification methods. Applications: Neural network applications: Process identification, Function Approximation, control and Process Monitoring, fault diagnosis and load forecasting. Fuzzy logic applications: Fuzzy logic control and Fuzzy classification**.**

TEXT BOOK:

1. Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications by Rajasekharan and Pai – PHI Publication.
2. Introduction to Artificial Neural Systems - Jacek M. Zuarda, Jaico Publishing House, 1997.

REFERENCE BOOKS:

1. Neural and Fuzzy Systems: Foundation, Architectures and Applications, - N. Yadaiah and S. Bapi Raju, Pearson Education
2. Neural Networks – James A Freeman and Davis Skapura, Pearson, 2002.
3. Neural Networks – Simon Hykins , Pearson Education
4. Neural Engineering by C.Eliasmith and CH.Anderson, PHI
5. Neural Networks and Fuzzy Logic System by Bork Kosko, PHI Publications

MTPE 25A DIGITAL CONTROL SYSTEMS
(Elective-III)

Class: M.Tech. II Semester **Lectures: 4**
Branch: EEE (Power Electronics) **University Examination: 100 Marks**
Duration of University Examination: 3 Hours **Sessionals: 50 Marks**

Course Objectives:
The students will be able to:
1. The Z-transform of a function and mapping between S-plane and Z- plane.
2. The properties and computation of state transition matrix.
3. Understand the stability analysis of closed loop system in Z-plane.
4. Know the designing of state feed back controller.

UNIT – I

SAMPLING AND RECONSTRUCTION Introduction sample and hold operations, Sampling theorem, Reconstruction of original sampled signal to continuous-time signal.
THE Z – TRANSFORMS Introduction, Linear difference equations, pulse response, Z – transforms, Theorems of Z – Transforms, the inverse Z – transforms, Modified Z- Transforms.
Z-PLANE ANALYSIS OF DISCRETE-TIME CONTROL SYSTEM Z-Transform method for solving difference equations; Pulse transforms function, block diagram analysis of sampled – data systems, mapping between s-plane and z-plane: Primary strips and Complementary Strips.

UNIT – II

STATE SPACE ANALYSIS State Space Representation of discrete time systems, Pulse Transfer Function Matrix solving discrete time state space equations, State transition matrix and it's Properties, Methods for Computation of State Transition Matrix, Discretization of continuous time state – space equations
CONTROLLABILITY AND OBSERVABILITY Concepts of Controllability and Observability, Tests for controllability and Observability. Duality between Controllability and Observability, Controllability and Observability conditions for Pulse Transfer Function.

UNIT – III
STABILITY ANALYSIS Stability Analysis of closed loop systems in the Z-Plane. Jury stability test – Stability Analysis by use of the Bilinear Transformation and Routh Stability criterion. Stability analysis using Liapunov theorems.

UNIT – IV

DESIGN OF DISCRETE TIME CONTROL SYSTEM BY CONVENTIONAL METHODS
Design of digital control based on the frequency response method – Bilinear Transformation and Design procedure in the w-plane, Lead, Lag and Lead-Lag compensators and digital PID controllers. Design digital control through deadbeat response method.

UNIT – V

STATE FEEDBACK CONTROLLERS AND OBSERVERS Design of state feedback controller through pole placement – Necessary and sufficient conditions, Ackerman's formula.
State Observers – Full order and Reduced order observers.
Linear Quadratic Regulators
Min/Max principle, Linear Quadratic Regulators, Kalman filters, State estimation through Kalman filters, introduction to adaptive controls.

TEXT BOOKS:

1. Discrete-Time Control systems - K. Ogata, Pearson Education/PHI, 2nd Edition
2. Digital Control and State Variable Methods by M.Gopal, TMH

REFERENCE BOOKS:

1. Digital Control Systems, Kuo, Oxford University Press, 2nd Edition, 2003.
2. Digital Control Engineering, M.Gopal

MTPE 25B POWER QUALITY
(Elective – III)

Class: M.Tech. II Semester **Lectures: 4**
Branch: EEE (Power Electronics) **University Examination: 100 Marks**
Duration of University Examination: 3 Hours **Sessionals: 50 Marks**

Course Objectives:
The students will be able to:
1. Understand the effect of nonlinear loads and disturbances on sensitive loads.
2. Know the standards and classification of power quality disturbances
3. Known the causes and effects of interruptions
4. Understand the concepts of causes and measurement of voltage sag
5. Get knowledge on effects and mitigation of voltage sag.

UNIT – I

Introduction : Introduction of the Power Quality (PQ) problem, Terms used in PQ: Voltage, Sag, Swell, Surges, Harmonics, over voltages, spikes, Voltage fluctuations, Transients, Interruption, overview of power quality phenomenon, Remedies to improve power quality, power quality monitoring.

UNIT – II

Long Interruptions : Interruptions – Definition – Difference between failure, outage, Interruptions – causes of Long Interruptions – Origin of Interruptions – Limits for the Interruption frequency – Limits for the interruption duration – costs of Interruption – Overview of Reliability evaluation to power quality, comparison of observations and reliability evaluation.

Short Interruptions : Short interruptions – definition, origin of short interruptions, basic principle, fuse saving, voltage magnitude events due to re-closing, voltage during the interruption, monitoring of short interruptions, difference between medium and low voltage systems. Multiple events, single phase tripping – voltage and current during fault period, voltage and current at post fault period, stochastic prediction of short interruptions.

UNIT – III

Voltage sag – characterization – Single phase: Voltage sag – definition, causes of voltage sag, voltage sag magnitude, monitoring, theoretical calculation of voltage sag magnitude, voltage sag calculation in non-radial systems, meshed systems, voltage sag duration.

Voltage sag – characterization – Three phase: Three phase faults, phase angle jumps, magnitude and phase angle jumps for three phase unbalanced sags, load influence on voltage sags.

UNIT – IV

PQ considerations in Industrial Power Systems: Voltage sag – equipment behaviour of Power electronic loads, induction motors, synchronous motors, computers, consumer electronics, adjustable speed AC drives and its operation. Mitigation of AC Drives, adjustable speed DC drives and its operation, mitigation methods of DC drives.

UNIT – V

Mitigation of Interruptions and Voltage Sags: Overview of mitigation methods – from fault to trip, reducing the number of faults, reducing the fault clearing time changing the power system, installing mitigation equipment, improving equipment immunity, different events and mitigation methods. System equipment interface – voltage source converter, series voltage controller, shunt controller, combined shunt and series controller.

Power Quality and EMC Standards: Introduction to standardization, IEC Electromagnetic compatibility standards, European voltage characteristics standards, PQ surveys.

REFERENCE BOOK:

"Understanding Power Quality Problems" by Math H J Bollen. IEEE Press.

MTPE 25C ADVANCED DIGITAL SIGNAL PROCESSING
(Elective – III)

Class: M.Tech. II Semester **Lectures: 4**
Branch: EEE (Power Electronics) **University Examination: 100 Marks**
Duration of University Examination: 3 Hours **Sessionals: 50 Marks**

Course Objectives:
The students will be able to:
1. Learn the design of FIR and IIR digital filter circuits.
2. Understand the computation of Fourier Transform and its application to tunable digital filter analysis
3. Learn the quantization of digital filter signal
4. Know the estimation of power spectrum.

UNIT – I

Digital Filter Structures Block diagram representation – Equivalent Structures – FIR and IIR digital filter Structures AII pass Filters-tunable IIR Digital Sine-cosine generator- Computational complexity of digital filter structures.

UNIT – II

Digital filter design Preliminary considerations- Bilinear transformation method of IIR filter design –design of Low pass highpass – Bandpass, and Band stop- IIR digital filters – Spectral transformations of IIR filters – FIR filter design –based on Windowed Fourier series – design of FIR digital filters with least – mean square-error – constrained Least –square design of FIR digital filters.

UNIT – III

DSP algorithm implementation. Computation of the discrete Fourier transform- Number representation – Arithmetic operations – handling of overflow – Tunable digital filters – function approximation.

UNIT – IV

Analysis of finite Word length effects The Quantization process and errors-Quantization of fixed –point and floating –point Numbers – Analysis of coefficient Quantization effects – Analysis of Arithmetic Round-off errors- Dynamic range scaling – signal –to- noise in Low – order IIR filters- Low –Sensitivity Digital filter – Reduction of Product round-off errors feedback – Limit cycles in IIR digital filter – Round – off errors in FFT Algorithms.

UNIT – V

POWER Spectrum Estimation: Estimation of spectra from Finite Duration Observations signals- Non-parametric methods for power spectrum Estimation- parametric method for power spectrum Estimation- Estimation of spectral form-Finite duration observation of signals- Non-parametric methods for power spectrum estimation – Walsh methods – Blackman and torchy method.

REFERENCE BOOKS:

1. Digital signal processing –Sanjit K. Mitra – TMH second edition
2. Discrete Time Signal Processing – Alan V. Oppenheim, Ronald W, Shafer – PHI 1996 1ST Edition reprint
3. Digital Signal Processing principles – algorithms and Applications- john G. Proakis – PHI – 3RD edition 2002.
4. Digital Signal Processing – S Salivahanan. A. Vallavaraj C. Gnanapriya – TMH – 2nd reprint 2001.
5. Theory and Applications of Digital Signal Processing –Lourens R Rebinarand Bernold.
6. Digital Filter Analysis and Design Auntoniam – TMH.

MTPE 26A RELIABILITY ENGINEERING
(Elective – IV)

Class: M.Tech. II Semester **Lectures: 4**
Branch: EEE (Power Electronics) **University Examination: 100 Marks**
Duration of University Examination: 3 Hours **Sessionals: 50 Marks**

Course Objectives:
The students will be able to:
1. Learn about the element's of probability theory
2. Learn about the significance of reliability and hazard models.
3. Learn about the reliability logic diagrams.
4. Learn about the Discrete Markov chains and reliability evaluation of repairable systems.

UNIT – I

Elements of probability theory Probability distributions: Random variables, density and distribution functions. Mathematical expectation. Binominal distribution, Poisson distribution, normal distribution, exponential distribution, Weibull distribution.

UNIT – II

Definition of Reliability. Significance of the terms appearing in the definition.
Component reliability, Hazard rate, derivation of the reliability function in terms of the hazarad rate. Hazard models.
Failures: Causes of failures, types of failures (early failures, chance failures and wear-out failures). Modes of failure. Bath tub curve. Effect of preventive maintenance. Measures of reliability: mean time to failure and mean time between failures.

UNIT – III

Reliability logic diagrams (reliability block diagrams) Classification of engineering systems: series, parallel, series-parallel, parallel-series and non-series-parallel configurations. Expressions for the reliability of the basic configurations.
Reliability evaluation of Non-series-parallel configurations: minimal tie-set, minimal cut-set and decomposition methods. Deduction of the minimal cutsets from the minimal pathsets.

UNIT – IV

Discrete Markov Chains: General modelling concepts, stochastic transitional probability matrix, time dependent probability evaluation and limiting state probability evaluation. Absorbing states.
Continuous Markov Processes: Modelling concepts, State space diagrams, Stochastic Transitional Probability Matrix, Evaluating limiting state Probabilities.
Reliability evaluation of repairable systems.

UNIT – V

Series systems, parallel systems with two and more than two components, Network reduction techniques. Minimal cutset/failure mode approach.

TEXT BOOKS :
1. " RELIABILITY EVALUATION OF ENGINEERING SYSTEMS", Roy Billinton and Ronald N Allan, Plenum Press

MTPE 26B ENTERPRISE RESOURCE PLANNING
(ELECTIVE-IV)

Class: M.Tech. II Semester **Lectures: 4**
Branch: EEE (Power Electronics) **University Examination: 100 Marks**
Duration of University Examination: 3 Hours **Sessionals: 50 Marks**

Course Objectives:
The students will be able to:
1. Understand the concept of business modeling.
2. Know the management domains in power plants.
3. Know the customer load control and market planning.
4. Understand the need for cost benefit analysis.

UNIT – I

General modes for ERP, Integrated management information; Benefits of ERP. Business modelling for ERP. Representative lists of various core processes and of entities forming data model.

UNIT – II

Problem statement ; Key issues; Implementation methodology and guidelines. ERP Domain in power plants: Power plant management, Project management, Operation management, Maintenance Management, Fuel management, Materials management, Human resource management, Finance management, Safety management, and Environment management

UNIT – III

Introduction to IRP and DSM; Framework of DSM. Customer load control; Interruptible electric service; Various evaluation criteria, Rate design in DSM: Objectives, Time - of - use (TOU) rate.

UNIT – IV

Market planning, generic load - shape changes Evaluating DSM programs, an overview of detailed evaluation approach.

UNIT – V

Cost benefit analysis, consumer perspective, utility perspective. Customer acceptance of DSM programs. Strategic marketing, Marketing implementation strategies.

REFERENCES :

1. Vinod Kumar Garg and N.K. Venkita Krishnan : “Enterprise Resource Planning - Concepts and Practice”, Prentice - Hall of India Pvt. Ltd., 1999
2. C.W. Gellings and J.G. Chamberlin : “Demand - Side Management : Concepts and Methods”, The Fairmont Press, Inc, 1993.

MTPE 26C EMBEDDED SYSTEMS
(Elective-IV)

Class: M.Tech. II Semester **Lectures: 4**
Branch: EEE (Power Electronics) **University Examination: 100 Marks**
Duration of University Examination: 3 Hours **Sessionals: 50 Marks**

Course Objectives:
The students will be able to:
1. Analyze the design issues of embedded systems, Design simple embedded system.
2. Learn basic issues of microcontroller, architecture and programming of 8051.
3. Learn architecture of PSOC, configurable Analog blocks, Digital blocks and I/O Blocks.
4. Learn basics of real time operating system, RTOS compliers, assemblers, Linker/Locators and debugging techniques.
5. Learn concepts of advanced architectures like ARM, SHARC and Networked embedded systems.

UNIT – I

Overview of Embedded System: Embedded System, types of Embedded System, Requirements of Embedded System, Issues in Embedded software development, Applications.

UNIT – II

Processor & Memory Organization: Structural units in a processor, Processor selection, Memory devices, Memory selection, Memory Allocation & Map; Interfacing

UNIT – III

Devices, Device Drivers & Buses for Device Networks: I/O devices, Timer & Counter devices, Serial Communication, Communication between devices using different buses. Device drives, Parallel and serial port device drives in a system, Interrupt servicing mechanism, context and periods for context switching, Deadline and Interrupt Latency.

UNIT – IV

Programming & Program Modeling Concepts: Program elements, Modeling Processes for Software Analysis, Programming Models, Modeling of Multiprocessor Systems, Software algorithm Concepts, design, implementation, testing, validating, debugging, Management and maintenance, Necessicity of RTOS.

UNIT – V

Hardware and Software Co-Design : Embedded system design and co design issues in software development, design cycle in development phase for Embedded System, Use of ICE & Software tools for development of ES, Issues in embedded system design.

REFERENCE BOOKS:

1. Embedded Systems: Architecture, Programming and Design – Rajkamal, TMH 2003
2. Programming for Embedded System: DreamTech Software Team-John Wiley -2002

MTPE 27 ELECTRICAL SYSTEMS SIMULATION LAB

Class: M.Tech. II Semester **Lectures: 4**
Branch: EEE (Power Electronics) **University Examination: 100 Marks**
Duration of University Examination: 3 Hours **Sessionals: 50 Marks**

Course Objectives:
The students will be able to:
1. Perform simulations study of stability of system.
2. Write a program for steady state and transient stability analysis of a power system,
3. Perform simulation for load frequency control of a single-area and two area systems.
4. Perform simulation analysis of various power electronic converters with different loads.

1. Write program and simulate dynamical system of following models:
   a) I/O Model
   b) State variable model
   Also identify time domain specifications of each.
2. Obtain frequency response of a given system by using various methods:
   (a) General method of finding the frequency domain specifications.
   (b) Polar plot
   (c) Bode plot
   Also obtain the Gain margin and Phase margin.
3. Determine stability of a given dynamical system using following methods.
   a) Root locus
   b) Bode plot
   c) Nyquist plot
   d) Liapunov stability criteria
4. Transform a given dynamical system from I/O model to state variable model and vice versa.
5. Obtain model matrix of a given system, obtain its diagonalize form if exists or obtain Jordon Canonical form of system.
6. Write a program and implement linear quadratic regulator
7. Design a compensator for a given systems for required specifications.
8. Conduct a power flow study on a given power system.
9. Design a PID controller.
10. Conduct a power flow study on a given power system network using Guass-Seidel iterative method.
11. Develop a program to solve Swing Equation.
12. Develop a Simulink model for a single area load frequency problem and simulate the same.
13. Develop a Simulink model for a two-area load frequency problem and simulate the same.
14. Design a PID controller for two-area power system and simulate the same.
15. PSPICE Simulation of Single phase full converter using RL and E loads.
16. PSPICE Simulation of Three phase full converter using RL and E loads.
17. PSPICE Simulation of Single phase AC Voltage controller using RL load.
18. PSPICE Simulation of Three phase inverter with PWM controller.
19. PSPICE Simulation of resonant pulse commutation circuit.
20. PSPICE Simulation of impulse commutation circuit.

MTPE 28 COMPREHENSIVE VIVA

Class: M.Tech. II Semester **University Examination: 100 Marks**
Branch: EEE (Power Electronics)

The Viva includes question from all the subjects of first and second semesters with more emphasis on Power Electronics Concepts.

MTPE 31 INDUSTRIAL TRAINING

Class: M.Tech. III Semester **Duration: 8 Weeks**
Branch: EEE (Power Electronics) **Sessionals: Satisfactory/ Not Satisfactory**

The candidate should submit the report and present talk on the training undergone highlighting the contents of the Report before the Departmental Post-Graduate Review Committee (DPGRC).

MTPE 32 DISSERTATION

Class: M.Tech. III Semester **Duration: 18 Weeks**
Branch: EEE (Power Electronics) **Sessionals: 100 Marks**

The candidate will chose the topic of the Project Work in consulation with the Guide allotted. A report in the prescribed format is to be submitted that includes extensive survey of literature on the topic, highlighting the scope of the work. It should also state the methodology to be adopted and work involved in different modules of the Project Work. The report should clearly specify the expected outcome.

The candidate should submit the report and present talk on the work done, highlighting the contents of the Report before the Departmental Post-Graduate Review Committee (DPGRC).

MTPE 41 DISSERTATION & VIVA-VOCE

Class: M.Tech. IV Semester **Duration: 24 Weeks**
Branch: EEE (Power Electronics) **Sessionals: 100 Marks**
University Examination: 100 Marks

The candidate should submit the report and present talk on the work done, highlighting the conclusions drawn and outcome of the work before the Departmental Post-Graduate Review Committee (DPGRC).