

**SAMRAT ASHOK TECHNOLOGICAL INSTITUTE, VIDISHA
(Engineering College)**

Course Contents & Grade

Branch	Subject Title	Subject Code	Credits		End Sem Marks
			Theory	Practical	
M.E. Power Electronics II sem.	Solid State Controller of Drive	MEPE-2221	3	--	Max 60

UNIT – 1

Microprocessor based control of converters such as rectifiers. Chopper.

UNIT-II

Microprocessor based control of Inverters cyclo-converters. Use of PLL

UNIT-III

Field oriented control (Vector control) and programmable controllers for three phase drives. Steady state and transient analysis of phase controlled converter fed and chopper fed D C drives torque speed curves.

UNIT-IV

Steady state and transient analysis of three phase induction motor drives
(i) Variable stator voltage control (ii) Variable frequency controls (iii) V/F control
(iv) slip recovery scheme (v) Vector control. Torque speed curves.

UNIT-V

Steady state and transient analysis of three-phase synchronous motor drives
(i) VSI and CSI fed PWM controlled drive (ii) True mode and self control mode of operation (iii) Brushless excitation scheme (iv) Switched Reluctance scheme. Torque speed curves.

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

**SAMRAT ASHOK TECHNOLOGICAL INSTITUTE, VIDISHA
(Engineering College)**

Course Contents & Grade

Branch	Subject Title	Subject Code	Credits		End Sem Marks
			Theory	Practical	
M.E. Power Electronics II sem.	Advanced Microprocessor	MEPE-2222	3	--	Max 60

Unit- I

Review of basic microprocessor and microcomputer concepts and the architecture and instruction set of a typical 8 bit microprocessor.

Unit -II

ADVANCED PROCESSORS : Overview of 16 bit/32bit/64bit Intel based microprocessors. Arithmetic and I/O coprocessor architecture. Register details, operation, addressing modes & instruction set of a typical 16 bit microprocessor assembly language programming for the processor. Introduction to multiprocessing, assembler directives.

Unit -III

PROGRAMMABLE SUPPORT CHIPS : Programmable parallel interface chip (e.g. 8255) functional schematic . Pin function operating mode interface with microprocessors chip programming serial communication interface chip(e.g. 8251) functional systematic pin function. Operating mode interface with processor mode and command words for the chip programmable interrupt controller (8259) functional systematic pin function single and cascaded operation interface with microprocessor.

Unit -IV

ANALOG INPUT AND OUTPUT : Microprocessor compatible ADC and DAC chips interfacing ADC with microprocessor, use of sample and hold circuit and multiplexer with ADC, interfacing DAC with microprocessor.

Unit- V

PROGRAMMABLE TIMER AND DMA CHIP : Programmable interval timer(8254), functional schematic, pin function, memory interfacing, modes of operation, DMA controller(8257), functional block diagram and interfacing.

Reference Books:-

1. Advanced Microprocessors & peripherals, A.K. Ray, K.M. Burchandi, TMH
2. Microprocessor, Gaonkar
3. Microprocessor and Interfacing, Programming & Hardware, TMH Publication

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE, VIDISHA
(Engineering College)

Course Contents & Grade

Branch	Subject Title	Subject Code	Credits		End Sem Marks
			Theory	Practical	
M.E. Power Electronics II sem.	Advanced Control System	MEPE-2223	3	--	Max 60

UNIT – I

Review 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, Diode & Nyquist analysis, Root Loci, Effect of load disturbance upon control actions.

UNIT-II

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

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE, VIDISHA
(Engineering College)

Course Contents & Grade

Branch	Subject Title	Subject Code	Credits		End Sem Marks
			Theory	Practical	
M.E. Power Electronics II sem.	Computer Aided Power System Analysis	MEPE-2224 (B) (Elective-II)	3	--	Max 60

UNIT -I

Network modelling, Impedance and Admittance representation. Power flow analysis Gauss Siedel method – Newton Raphson method – DLF and FDLF method, DC Load flow, sparsity oriented programming.

UNIT -II

3-Φ AC Load flow analysis: Introduction to 3-Φ AC Load flow, problem formulation, fast decoupled 3-Φ AC Load flow algorithm. Introduction to AC-DC load flow, problem formulation and analysis. 3-Φ AC-DC Load flow concept, problem formulation, assumptions made.

UNIT -III

Short circuit analysis of a multi node system using bus impedance matrix, Z-bus building algorithm, asymmetrical fault analysis using Z-bus, development of voltage and current equations under asymmetrical fault using symmetrical components.

UNIT -IV

Computer control of power system:- Need of real time and computer control of power system, Operating states of power system, Supervisory control and data acquisition system, Energy Management Centers.

TEXT BOOKS

1. Power System Stability and Control: –P.Kundur – McGraw Hill publications
2. . Computer Modelling of Electric Power Systems: - J Arrillaga and N R Watson, John Wiley and sons,2001
3. John J Grainger and William D Stevenson Jr: -Power System Analysis, McGraw Hill

REFERENCES

1. E. Handschin: Real time control of electrical power systems, Elsevier Pub. Co. 1988
2. Allen J Wood and Bruce Woolenberg: Power system Generation, Operation and Control, John Wiley and sons, 1996

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE, VIDISHA
(Engineering College)

Course Contents & Grade

Branch	Subject Title	Subject Code	Credits		End Sem Marks
			Theory	Practical	
M.E. Power Electronics II sem.	Power Electronics Supply System & Design	MEPE-2225 (B) Elective III	3	--	Max 60

UNIT-I

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

UNIT- II

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 magnetic, converter control, average model, state- space model.

UNIT -III

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- IV

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

UNIT- V

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, MC graw Hill Publication 1991.
5. Handbook of Power Electronics M H Rashid.

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE, VIDISHA
(Engineering College)

Course Contents & Grade

Branch	Subject Title	Subject Code	Credits		End Sem Marks
			Theory	Practical	
M.E. Power Electronics II sem.	Computer Aided Design of Electrical Machines	MEPE-2225 (A) (Elective-III)	3	--	Max 60

Unit-I

Introduction: Design problem-Mathematical programming methods, computer aided design- Mathematical formulation of the problem. Programming techniques (LP & NLP only), Methods of solution, Unconstrained optimization problems, constrained optimization problems.

Unit-II

Optimal design of DC machines: design of armature, windings and field systems, selection of variables for optimal design, formulation of design equations, objective function, constraint functions, algorithms for optimal design.

Unit-III

Optimal design of power transformer: design of magnetic circuit, design of windings, selection of variables for optimal design, formulation of design equations, objective function, constraint functions, algorithms for optimal design.

Unit-IV

Optimal design for 3-phase alternator: Design of stator, windings, Design of Field systems for salient pole and non-salient pole machines, Selection of variables for optimal design, Formulation of design equations, Objective function, Constraint functions, Algorithms for optimal design.

Unit-V

Optimal design of 3-phase induction motor: Design of stator-winding, design of squirrel cage rotor, design of slip ring rotor, selection of variables for optimal design, Formulation of design equations, Objective functions Constraint functions, Algorithms for optimal design.

References:

1. Computer- Aided Design of Electrical Equipment- by Dr. M. Ramamoorthy-Affiliated East West press Pvt. Ltd. New Delhi.
- 2 Electrical Machine Design- by A.K. Sawhney, Dhanpat Rai & Sons.
- 3 Principles of Electrical Machine Design with Computer Programmes by- S.K. Sen, Oxford & IBH Publishing Co.
- 4 Performance and Design of A.C. Machines-M.G. Say, Affiliated East West Press Pvt. Ltd., New Delhi.
- 5 Performance and Design of D.C. Machines- Clayton & Hancock.
- 6 Computer- Aided Electrical Machine Design- by K.Prasad,,Satya Publication,Delhi