Shivaji University, Kolhapur

SYLLIBUS/ STRUCTURE (REVISED from June- 2009)

T.E. Electrical (Semester – V)

Sr. No.	Name of the Subject	Teaching Scheme				Examination Scheme			
		L	T	P	Total Hours	TH	TW	POE/ OE	Total Marks
01	Electromagnetics	4	--	--	4	100	--	--	100
02	Power Systems Analysis	4	--	2	6	100	25	50	175
03	Instrumentation Techniques	3	--	2	5	100	25	---	125
04	Feedback Control systems	4	--	2	6	100	25	25	150
05	Digital Signal Processing	3	--	2	5	100	25	25	150
06	Mini project	--	--	2	2	--	50	--	50
07	Introduction to PSIM / EMTP / ETAP/MiPower	--	--	2	2	--	50	--	50
Total		18		12	30	500	200	100	800

T.E. (Electrical Engineering) (Semester - VI)

Sr. No.	Name of the Subject	Teaching Scheme				Examination Scheme			
		L	T	P	Total Hours	TH	TW	POE/ OE	Total Marks
01	Power System Stability and Control	4	--	2	6	100	25	--	125
02	Control Systems Design	4	--	2	6	100	25	25	150
03	Power Electronics	3	--	2	5	100	25	50	175
04	Microcontroller and its applications	4	--	2	6	100	25	50	175
05	Communication Engineering	3	--	2	5	100	25	--	125
06	Seminar	--	--	2	2	--	50	--	50
Total		18	--	12	30	500	175	125	800

NOTE: Industrial Training of 15 days is to be completed in summer vacation after TE-Part-II. Report should be prepared. It will be assessed in BE (Electrical) part-I (SEM- VII).

T.E. (Electrical Engineering) (Semester- V)

01. Electromagnetics

Teaching Scheme: Examination Scheme:
Lectures: 4 Hours /Week Paper: 100 Marks

SECTION I

1. Vector Analysis: (05 Hrs)
Introduction, Coordinate systems and Transformations, Differential Length, Area and Volumes, Vector calculus. Numericals expected.

2. Electrostatics: (10 Hrs)
Coulomb's law, Electric field intensity due to point Charge, line charge, surface charge and volume charge distribution, Electric flux density, Gauss's law and Divergence theorem, Energy, potential energy and work done, potential gradient, dipole and its electric field, dipole movement, energy density in electrostatic field. Numericals expected.

3. Conductor, Dielectrics and Capacitance: (8 Hrs)
Current and current density, Continuity equation of current, properties of conductors, boundary conditions, Energy stored in capacitors, Poisson's and Laplace's equations, Capacitance between parallel plates and co-axial cable using Laplace's equation, Numericals expected.

SECTION II

4. Magnetostatics: (10Hrs)
Biot Savert's law and its vectorial form, Magnetic field due to infinitely long current carrying conductor, Ampere's circuital law, Application to co-axial cable. Curl operator, Magnetic flux density, Stoke's theorem. Scalar and vector magnetic potential, Lorentz's force equation. Energy stored in magnetic field, boundary conditions. Numericals expected.

5. Time varying fields: (08 Hrs)
Faraday's law, Maxwell's equations (Differential, Integral, Phasor forms), Uniform plane waves, Representation of wave motion in conductor and free space, perfect dielectrics Pointing theorem and power density, Propagation in good conductor and Skin effect, Numericals expected.

6. Transmission line and Radiation: (07 Hrs)
Transmission Line: Impendence matching, single and double stub transmission line, Introduction to Smith Chart.
Radiation: Radiation resistance, Radiation pattern, Calculation of radiation resistance for Short dipole, Short monopole and Quarter wave monopole, antennas directivity, Reciprocity between Transmitting and receiving antennas, Hertzian dipole, Vector retarded potential.

Reference Books

1 Engineering Electromagnetic, W. Hayt, Tatat McGraw Hill (7th Edition)
2 Antenna and Wave Propagation, K .D. Prasad, Satya Prakashan
3 Electromagnetic field theory fundamental, Guru and Hizirogli,, Thomson Publication
4 Electromagnetic, J.D. Kraus, McGraw Hill, 4th Edition
5 Electromagnetic Engineering, Ryder

T.E. (Electrical Engineering) (Semester- V)

02. Power System Analysis

Teaching Scheme:
Lectures: 04 Hours/Week
Practical: 02 Hours/Week

Examination Scheme:
Paper: 100 Marks
T.W.: 25 Marks
OE: 50 Marks

SECTION - I

1. Power System Components: (02 Hrs.)
Single line diagram of power system, Brief Description of Power system elements such as, Synchronous Machine, Transformer, Bus bar, Circuit Breaker, isolator, CT, PT.

2 A.C. Distribution Systems: (05 Hrs.)
Primary and Secondary systems, Overhead and Underground systems, Connection scheme of distribution system, Radial system, Ring main system, Interconnected systems, feeders and distributors, AC distribution calculations, overview of Distribution Automation, Numericals expected.

3 Overhead Transmission Line parameters: (09 Hrs.)
Types of conductors, bundled conductor, symmetrical and unsymmetrical spacing, equivalent spacing, transposition, influence of voltage on cost and efficiency, comparison of different systems of transmission, calculation of resistance, concept of self GMD, mutual GMD, inductance and capacitance for single circuit and double circuit lines, skin and proximity effect, Numericals expected.

4 Design Aspects of Overhead Transmission Lines: (08 Hrs.)
Main components of over head lines, conductor materials, line supports, insulators, types of insulators, potential distribution over suspension insulators, string efficiency, methods of improving string efficiency, corona, factors affecting corona, important terms, advantages and disadvantages of corona, methods of reducing corona effect, sag in over head lines and sag calculations, Numericals expected.

SECTION - II

5. Characteristics and Performance of Transmission Line: (09 Hrs.)
Short, medium and long lines, Voltages and currents at sending and receiving end of line, ABCD constants, Sending end and receiving power circle diagrams, universal power circle diagram, voltage and current waves, surge impedance loading of transmission line, Complex Power flow through transmission line, Power transmission capability, Ferranti effect, tuned power lines, methods of voltage control, voltage regulators, tap changing transformers, booster transformers, synchronous phase modifiers, Numericals expected.

6. Underground Cables: (04 Hrs.)
Construction and classification of cables for single and three phase service, Insulation resistance, capacitance and dielectric stresses in cable, Most economical conductor size in cables, Grading of cables, capacitance grading and inter-sheath grading, Capacitance of three core cable and measurements of capacitances, Methods of laying underground cables.

7. Load Flow Analysis: (09 Hrs.)
Network Model Formulation, Formation of Bus Admittance Matrix, Power Flow Equations, Gauss-Seidal method, Newton-Raphson method, Decoupled and Fast decoupled Methods, Comparison of Load Flow Methods, Numericals expected.

8. Power Factor Improvement:- (02 Hrs.)
Causes and disadvantages of Low power factor, power factor improvement using Static capacitors, synchronous condensers, phase advancers, Numericals expected.

Term Work:

Term work should consist of following:

1. Two drawing sheets based on above theory
2. Minimum 8 exercises based on topics like ABCD constants, Load Flow Analysis using mathematical software like MiPower, PSIM, EMTP, ETAP,MATLAB.
3. Hand written Technical Report (after visiting sub-station):

Technical report should consist of following theoretical and practical aspects of Sub- stations

- Type of Sub-station and it's location,
- Major components of sub-station and their functions,
- Different Bus bar arrangements (Single and Duplicate bus bar Systems)

Ratings and make of sub-station equipment should be included in study.

Reference Books:

1. Elements of Power System Analysis, by W.D. Stevenson (Jr.), 4th Edition, McGraw Hill International, 1982.
2. Modern Power System Analysis by I. J. Nagrath, D. P. Kothari, 3rd Edition, Tata McGraw Hill Publishing Co. Ltd., 2003.
3. Power System Analysis and Design by J.D.Glover and M.Sarma, 3rd Edition, Brooks/ Cole Publishing, 2002.
4. Electric Power Systems by Weedy B M, Cory B J,John Wiley Publication, latest edition
5. Power System Analysis by Grainger John J and W D Stevenson Jr. McGraw Hill, 1994
6. Power System Analysis by Hadid Sadat, McGraw Hill International, latest edition

T.E. (Electrical Engineering) (Semester- V)

03. Instrumentation Techniques

Teaching Scheme: Examination Scheme:
Lectures: 03 Hours/Week Paper: 100 Marks
Practical: 02 Hours/Week T.W.:25 Marks

SECTION - I

1. Overview of instrumentation systems: (03 Hrs)
Importance of measurement of nonelectrical parameters, Instrumentation system configuration, Brief idea of static characteristics of measuring devices.

2. Transducers: (06Hrs.)
Definition, various types of transducers, variable parameter transducers, selection factors and typical applications of transducers, Transducers for measurement of pressure, temperature, displacement, strain, speed, velocity, acceleration, torque and vibration.

3. Signal Conditioning: (05 Hrs.)
Chopper stabilized amplifier, Instrumentation amplifier, isolation and programmable gain amplifier, grounding and shielding, active filters, practical comparators, modulators, demodulators, sine and other waveform generation.

4. Data conversion and acquisition: **(** 04 Hrs.)
Principles and working of different types of ADC and DAC (Detail study of 0808/0809 and 0800), Data acquisition systems, Sample and hold circuit, frequency to voltage, voltage to frequency and current to voltage converter.

SECTION - II

5. Programmable Logic Controller: (07 Hrs.)
Introduction to PLC hardware, CPU memory, input and output units, explanation of ladder diagram logic with examples, Instrumentation set and types of PLC System, PLC Communication and networking, PLC Selection and Installation.

6. Input-Output Devices: (07 Hrs.)
Analog display, Oscillograph, X-Y recorders, Digital data recorders, Digital input and output devices, LCD, 7 segment display, Digital input and output devices.

7. Industrial Instrumentation: (04 Hrs.)
Introduction to Process Instrumentation, Instrumentation set up for measurement of physical quantities using transducers studied in topic 2 above.

Term Work: Minimum 08 Experiments based on above syllabus including transducers, data acquisition systems, PLC.

Reference Books:

1. A course in Electrical, Electronics measurement and Instrumentation, By A.K.Sawhney
2. Instrumentation Devices and Systems, Rangan, Mani, Sharma.
3. Process Control Instrumentation Technology, Johnson.
4. Electronic Instrumentation and Measurement Techniques, Welfrick Cooper.
5. Industrial Instrumentation and Control, S.K.Singh.

T.E. (Electrical Engineering) (Semester- V)

04. Feedback Control Systems

Teaching Scheme:
Lectures : 4Hrs/week
Practical: 2 Hrs./week

Examination Scheme:
Theory Paper : 100 Marks
T.W. : 25 Marks
POE : 25 Marks

SECTION – I

1. Representation of Control system and transfer function: (07Hrs)
History of Control Systems, Laplace Transform review, Transfer function of electrical, mechanical, thermal, hydraulic Systems, System with dead time elements, Electric circuit analogs, Block diagram representation and reduction, types of feedback systems, Signal flow graph, Mason's Rule, S.F.G.

2. Modeling in the time domain: (12 Hrs.)
State space representation, Phase variable form, converting Transfer Function to State Space and vice versa, time response, Poles, Zeros and System Response, Response of first, second and general second order system, system response with additional poles, additional zeros, Laplace transform solution of state equations, Time domain solution of state equations, State equation like controller Canonical, Observer Canonical, Cascade, Parallel and Diagonal form, Similarity Transformation.

3. Control Devices and Systems: (05 Hrs.)
DC and AC servo motors and their transfer function, Motion control system, Hydraulic devices for motion control, Pneumatic devices for process control.

SECTION - II

4. Stability and Steady state Error: (07 Hrs.)
Routh criterion for stability and stability in state space, steady state error for unity feedback systems, static error constants and system type, steady state error specifications, steady state error for disturbances non unity feedback systems, sensitivity, steady state error for systems in state space, Root Locus Technique, Sketching the Root Locus.

5. Frequency response technique: (11 Hrs.)
Bode plot, Nyquist criterion , stability , gain margin , phase margin by Nyquist diagram and bode plots , relation between closed loop transient and closed loop frequency response, Relation between closed loop and open loop frequency response, Relation between closed loop transient and open loop frequency response , steady state error characteristics from frequency response, systems with time delay, obtaining transfer function experimentally.

6. Nonlinear Control System: (06 Hrs.)
Properties of Nonlinear Systems, Common Physical Nonlinearities in Control System, Linearization, Phase Plane Method, Limit Cycle in Phase Plane, Describing Function Method, Lyapunov Theory for Stability of Nonlinear and Linear Systems.

Term Work:
Minimum 08 experiments based on above syllabus should be performed.

Reference Books:

1. Control System Engineering, Norman S. Nise, 4th Edition, John Wiley and Sons, 2004
2. Control Systems Engineering, I.J. Nagrath and M. Gopal, 5th Edition, Anshan Publishers, 2008
3. Feedback Control Dynamic system, Franklin Powel 5th Edition Pearson Education, 2002
4. Modern Control system, Dorf and Bishop, 8th Edition Adison Wesley Longman 1998
5. Modern Control Engineering, Eastern Economy, K. Ogata, 4th Edition, 2002
6. Control System Principles and Design, M. Gopal, Tata Mc Graw Hill 3rd Edition, 2008.

T.E. (Electrical Engineering) (Semester- V)

05. Digital Signal Processing

Teaching Scheme:
Lecture1 : 3 Periods/week
Practical: 2 Hrs./week

Examination Scheme:
Theory Paper : 100 Marks
T.W. : 25 Marks
POE : 25 Marks

SECTION - I

1. Digital Signals and Systems: (06 Hrs.)

DSP system concept, properties of DSP system, types of systems, Interconnection of DSP systems, Recursive and Non recursive system, Some elementary signals and their responses
Case study: Realization of an Analog second-order differentiator.

2. The Discrete Fourier Transform and Fast Fourier Transform: (08Hrs.)

DFT, Relation between DFT and Z-transform, Properties of DFT, Linear Convolution Circular Convolution-DFT, FFT Algorithms, Use of DFT as Linear Filtering, DIT (Decimation in time), DIF (Decimation in frequency), Implementation aspects, Fast convolution signal segmentation (overlap save algorithm overlap-add algorithm), Correlation-Circular correlation, DFT property of circular correlation, Spectrum analysis,
Case study: electrocardiogram data compression.

3. MultiMate DSP: (04Hrs.)

Concept of Sampling Theorem (Nyquist Criterion), Requirement of changing sampling rate, Various methods of sampling rate conversion (Decimation, Interpolation), Benefits of up sampling and down sampling.

SECTION- II

4. Realization of Digital Linear System: (02 Hrs.)

Filter categories, IIR direct form structures, cascade, parallel realization, FIR filter realization, Different Forms of Realization (Direct and it's Transposed, Series, Parallel, lattice)

5. FIR Filter Design: (06 Hrs.)

Characteristics of FIR filter, Properties of FIR filter, Digital network for FIR Filter, Windowing method, Filter design using Kaiser Window, Hanning, Hamming, Barlett, Blackman, Frequency sampling method, Linear FIR filters and types.
Case Study: Low Pass, High Pass, Band Pass and Band stop Filters.

6. IIR Filter Design: (06Hrs.)

Impulse Invariant Technique, Bilinear transformation, Frequency band transformation, Analog filter approximation, (Butterworth, Chebyshev, Elliptic), (sin x)/x Digital Correction, Filter. Quantization and Rounding Problems, quantization of the signal, effects of Finite Word length on stability and frequency response, arithmetic errors.
Case study: Digital Filters for FSK Modem.

7. Practical Implementation Considerations: (04 Hrs.)

Introduction, architecture and applications of TMS 320 DSP Controller.

Term Work:

Minimum 08 experiments based on above syllabus should be performed out of which minimum four experiments consists use of MATLAB.

Reference Books:

1. Digital Signal Processing: A Student Guide, T. Terrel and Lik-Kwan Shark.
2. Digital Signal Processing Principles, Algorithms and Applications, G, Proakis.
3. Discrete Time Signal Processing, A. V. Oppenheim and R. W. Schafer (PHI)
4. Digital Signal Processing, A System Design Approach., D. Defatta.
5. Introduction to Digital Signal Processing, Johnny R. Johnson.

T.E. (Electrical Engineering) (Semester- V)

6. Mini project

Teaching Scheme: Examination Scheme:
Practical: 2 Hours/week T.W.: 50 Marks

A Group of **not more than 03** students should work to design, build and test a small electrical /electronics **hardware** project in the field of analog and digital systems, microprocessor.

T.E. (Electrical Engineering) (Semester- V)

7. Introduction to PSIM/EMTP/ETAP/MiPower softwares

Teaching Scheme: Examination Scheme:
Practical: 2 Hours/week T.W.: 50 Marks

Introduction of above softwares and their use for performing following experiments,

1. Development of Single Line Diagram of Power System.
2. Development of a simple radial feeder and load flow study.
3. Study of starting of D C motors.
4. Study of Starting and Speed control of Induction motor.
5. Study of Uncontrolled half wave and full wave single phase / three phase rectifier.

T.E. (Electrical Engineering)-Part-II (Semester- VI)

01. Power System Stability and Control

Teaching Scheme:
Lectures: 4 Hours /week
Practical: 2 Hours/week

Examination Scheme:
Paper: 100 Marks
T.W.: 25 Marks

SECTION- I

1. Symmetrical fault analysis: (04 Hrs.)

Short circuit transients on transmission line, short circuit currents and reactance of a Synchronous Machine, Internal voltages of loaded Synchronous machine under transient conditions, Numericals expected.

2. Symmetrical Components: (07 Hrs.)

Fundamentals of Symmetrical Components, sequence impedances and sequence networks of Synchronous machine, star connected loads, transmission lines and transformer.

3. Unsymmetrical fault analysis: (06 Hrs.)

Analysis of Single Line to Ground (LG) fault, Line-To-Line (LL) fault, Double-Line-To-Ground (LLG) fault, One conductor open fault, Two conductors open fault, Numericals expected.

4. Power System Control: (07 Hrs.)

Load frequency control (Single and two area), modeling of Generator, Governor, prime mover, Load, Load frequency control and economic dispatch, Automatic generation control, Steady state analysis and dynamic response of an isolated power system, Automatic voltage control, reactive power control.

SECTION- II

5. Optimal Power System Operation: (08 Hrs.)

System constraints, Generator operating cost, Input-output and incremental fuel characteristics of a generating unit, optimal operation of generators on a bus bar, algorithm and flow chart for optimal power flow study, optimal unit commitment, spinning reserve, thermal and hydro constraints, Numericals expected.

6. Power System stability: (12 Hrs.)

Dynamics of Synchronous machine, Swing equation for single machine connected to infinite bus, Steady state stability and transient state stability, Equal area criterion, Numerical solution of swing equation, factors affecting transient stability, methods for improving stability of system. Voltage stability analysis, mathematical formulation, voltage collapse, Numericals expected.

7. Power system Security: (04 Hrs.)

Brief Introduction to- System state classification, Security analysis, Contingency analysis, Sensitivity actors.

Term Work:

The laboratory exercise consists of (minimum 08 exercises) :

· Modeling and Simulation of Problems based on theoretical data.
· This simulation is to be carried out using software like MiPower, PSIM, ETAP, EMTP, MATLAB.

Reference Books:

1. Modern Power System Analysis by I. J. Nagrath, D. P. Kothari, 3rd Edition, Tata McGraw Hill Publishing Co. Ltd., 2003
2. Electrical power System by Ashfaq Husain, CBS Publishers and Distributors, Fifth Edition 2007
3. Power System Analysis by Grainger John J and W D Stevenson Jr. McGraw,Hill, 1994.
4. Power System Analysis by Hadi Sadat, McGraw Hill International, 1999.
5. Power System Analysis and Design, Third Edition by J. Duncan Glover and Mulukuta S. Sarma, Prentice Hall, 2002
6. Power System Analysis by A.R. Bergen and Vijay Vittal, 2nd edition, Pearson Education
7. Computer Methods in Power System Analysis - M.A. Pai

T.E. (Electrical Engineering)-Part-II (Semester- VI)

02. Control System Design

Teaching Scheme :
Lectures : 4 Hours /week
Practical : 2 Hours/week

Examination Scheme:
Paper : 100 Marks
T.W. : 25 Marks
O.E.: 25 Marks

SECTION- I

1.Principles of feedback control : (04 Hrs.)

Control objective, feedback control system characteristic, Proportional mode, integral mode, derivative mode of control system, alternative control system configurations.

2.Compensator design using Root locus : (10Hrs.)

Review of root locus concept, cascade lead compensation, cascade lag compensation, cascade lag -lead compensation, minor loop feedback compensation, compensation for plants with dominant complex poles,. root locus of system with dead time, sensitivity of root locus

3.System stability and performance in frequency domain : (10 Hrs.)

Review of Nyquist criterion, stability margins, stability margins on Bode plots, stability analysis with dead time, frequency response measurement, co-relation between time and frequency domain specification, M circles, Nicholes charts, sensitivity in frequency domain.

SECTION- II

4. Compensator design using Bode Plot: (08 Hrs.)

Introduction, Reshaping Bode plot, cascade lead compensation, cascade lag compensation, cascade lag -lead compensation, Robust control system.

5. Hardware Implementation: (08 Hrs.)

Introduction, passive electric network, operational amplifier usage, tunable PID controllers, Ziegler-Nichols method for controller tuning.

6. State space Design : (08 Hrs.)

Review of state space, controllability, observability, controller design using pole placement, Ackermann's formula, observer design using error dynamics, Ackermann's formula.

Term Work:

Ten laboratory exercises consist of minimum 06 exercises using MATLAB.

Reference Books:

1.Control system principles and design, M. Gopal, TMH publication, 3rd edition, 2008
2. Process control Instrumentation Technology by – C. D. Johnson, Pearson Education Ltd, 7th Edi., 2005
3.Automatic Control Engineering – Raven F. H McGraw Hill, 5th Edition, 1995
4.Modern Control Engineering Eastern Economy, K. Ogata, 4th Edition, 2002
5. Feedback Control Systems, C. L. Phillips, R. D. Harbor PHI publication, 1988

T.E. (Electrical Engineering)-Part-II (Semester- VI)

03. Power Electronics

Teaching Scheme :
Lectures: 3 Hours /week
Practical: 2 Hours/week

Examination Scheme:
Paper: 100 Marks
T.W. : 25 Marks
POE: 50 Marks

SECTION- I

1. Power Semiconductor Devices (06 Hrs.)

Power Diodes – working, characteristics, types, ratings, reverse recovery characteristics, series-parallel operation, applications of Power diodes. SCR-basic structure, working, static and switching characteristics, types, ratings, reverse recovery characteristics, Gate characteristic, turn on methods, series-parallel operation, protection, triggering circuits, applications of SCR, GTO, MOSFET, IGBT,Device structure, static characteristic, dynamic characteristic, ratings, applications of GTO, MOSFET and IGBT;
TRIAC-structure, static characteristics, different modes of operations, applications of TRIAC

2. Rectifiers: (03 Hrs.)

Single phase Half wave with R, RL load, Single phase and Three phase full bridge rectifier with R, RL and RLE load, mathematical expressions, issue of harmonics, applications of diode rectifiers, Numericals expected.

3. Single phase converter: (04 Hrs)

Single phase fully controlled and half controlled converters - Continuous and discontinuous mode of conduction, analysis with R,RL, RLE load, expressions for average output voltage, RMS, TUF, THD, Ripple factor, Modes of operation in the voltage-current plane, operation as an inverter, Dual converter, Simultaneous and non-simultaneous control, Effect of source inductance, harmonics analysis, Numericals expected.

4.Three phase converter: (05 Hrs)

Three phase half wave converter, R, RL, RLE load, expressions for average output voltage, RMS, TUF, THD, Ripple factor, DC magnetization of the input transformer, harmonics analysis Three phase fully controlled and half controlled converters with R, RL, RLE load, expressions for average output voltage, RMS, TUF, THD, Ripple factor, displacement factor, Inverter mode of operation, harmonic analysis, Effect of source inductance, Three phase dual converters, applications of controlled converters and dual converters. Numericals expected.

SECTION- II

5. Cycloconverters (05Hrs.)

Single phase to single phase cycloconverter with R and RL load, Three phase to Single phase cycloconverter, Three phase to three phase 3 and 6 pulse converter, circulating and non circulating mode, applications of cycloconverters.

6. Choppers: (05Hrs.)

Classification, Principle of working of Step-down Chopper, Step-up Chopper, Analysis, voltage control methods, Morgan Chopper, Jones Chopper, multiphase choppers. Numericals expected.

7. Inverters: (08 Hrs.)

Voltage source inverters, Single phase and three-phase- six step (120/180 degree mode of operation), thyristorised bridge circuits, output waveforms for R and R-L loads, harmonic analysis, PWM techniques-Single, Multiple and Sinusoidal PWM, applications of VSI, current Source Inverter, ASCCSI, advantages, applications of CSI. Numericals expected.

Term Work:
Minimum 8 experiments to be performed from the following List.

1. SCR/TRIC/ DIAC/ MOSFET/IGBT Characteristics.
2. Triggering circuits/phase control.
3. Single phase FW bridge converter feeding DC motor.
4. Three Phase Converter (HW and FW bridge).
5. Dual Converter.
6. Cycloconverter feeding Resistive load.
7. Jones/ Morgan Chopper.
8. Single phase / three phase Inverter with Resistive/Induction Motor load.
9. Simulation of Converter / Chopper using SPICE/MATLAB.
10. Simulation of PWM Inverter using SPICE/MATLAB.

Reference Books:
1. Power Electronics Circuits, Devices, and Application, M.H. Rashid, 2nd Edition, Prentice Hall of India, New Delhi, 1999.
2. Power Electronics, P.S. Bimbhra, 3rd , Edition, Khanna Pub., New Delhi, 1999.
3. Power Electronics, M.D. Singh and K.B. Khanchandani, Tata Mc-Graw-Hill, New Delhi, 1998.
4. SPICE for Power Electronics and Electric Power (Electrical and Computer Engineering): Muhammad H. Rashid, Hasan M. Rashid, Second Edition Prentice Hall of India, New Delhi.

T.E. (Electrical Engineering)-Part-II (Semester- VI)

04. Microcontroller and Its Applications

Teaching Scheme:
Lectures: 4 Hours /Week
Practical: 2 Hours/Week

Examination Scheme:
Paper : 100 Marks
T.W. : 25 Marks
POE: 50Marks

SECTION I

1. 8051 Architecture: (08 Hrs.)

8051 internal resources, pin diagram, I/O pins, ports and their internal logic circuits, counters, serial port, interrupt structure, SFRs and their addresses, watch dog timer, internal code memory, data memory, stack pointer, flags, bit addressable memory. Comparative study of 8051 families by diff manufacturers (ATMEL, DALLAS, PHILIPS, INFINION, SST).

2. Assembly Language Programming: (08 Hrs.)

Study of Instruction set of 8051- data move, logical, arithmetic, jump and call instructions, Interrupt handling, timer programming, serial port communication, use of assembler and C-8051 cross compiler, simulator.

3. Microcontroller based system design: (08 Hrs.)

External memory and space decoding, reset and clock circuits, expanding I/O, memory mapped I/O, memory addresses decoding, system testing and troubleshooting.

SECTION II

4. Real World Interfacing I: (08 Hrs.)

Interfacing various parallel devices to 8051 like 8255 PPI, Timer counter 8253, character LCD, 12 bit ADC such as AD574, DAC interfacing such as DAC0808, Single Key and matrix keyboards (4X4), seven segment LED modules.

5. Real World Interfacing II: (08 Hrs.)

Interfacing of various serial peripherals- 8051 data communication in 8 bit UART mode, multiprocessor mode, study of SPI , I2C communication protocols.

6. Microcontroller Applications (Block Schematic and flowchart): (08 Hrs.)

Microcontroller based automatic power factor control relay, solid state energy meter using ASIC, weighing balance, serial E2PROM interfacing, temperature indicator and controller, Real time clock using DS1307.

Term Work:

Minimum 10 experiments based on above syllabus should be performed. 05 practical should be based on assembly language programming (hardware and simulator) and 05 practical should be based on real world interfacing.

Reference Books:

1The 8051 Microcontroller Architecture, Programming and Applications, Kenneth Ayala, 2nd Edition, Penram International

2. The 8051 Microcontroller and embedded systems, Muhammad Ali Mazidi, Pearson Education

3. Device datasheet- ATMEL, DALLAS, SST.

4. 8051 Manual (Intel)

T.E. (Electrical Engineering)-Part-II (Semester- VI)

5. Communication Engineering

Teaching Scheme :
Lectures : 3 Hours /Week
Practical : 2 Hours/Week

Examination Scheme:
Paper : 100 Marks
T.W. : 25 Marks

SECTION I

1. Introduction to Signals: (04Hrs.)
Overview of electrical communication, Size of a signal, classification of signals, signal operations, unit impulse function, signals and vectors, correlation, orthogonal signal sets, Fourier series.

2. Analysis and Transmission of Signals: (05 Hrs.)
Fourier transform, signal transmission through a linear system, ideal and practical filters, signal distortion over a communication channel, signal energy, signal power, numerical computation of Fourier transform.

3. Amplitude Modulation: (05 Hrs.)
Base-band and carrier communication, amplitude modulation -DSB, AM, AM, SSB,VSB, carrier acquisition , super heterodyne AM receiver, television.

4. Angle Modulation: (04 Hrs.)
Concept of instantaneous frequency, band-width of angle modulated waves, generation of FM waves, demodulation of FM, Interference in angle modulated systems, FM receiver.

SECTION II

5. Sampling and Pulse Code Modulation: (04 Hrs.)
Sampling theorem, pulse-code modulation, differential pulse code modulation, delta modulation.

6. Digital Data Transmission: (06 Hrs.)
Basic digital communication system, line coding, pulse shaping, scrambler, regenerative repeater, detection-error probability, M-array communication, digital carrier systems digital multiplexing.

7. **Information theory and coding** (08 Hrs.)
Cellular telephone, spread spectrum systems, transmission media, public, switched telephone network.Measure of information, source encoding error free communication over a noisy channel, channel capacity of a discrete memory less channel, practical, communication systems in light of Shanon's equation, linear block codes.

Term Work:
Minimum 08 experiments to be performed from the following List.

1. Study of AM Transmitter
2. Study of FM Transmitter
3. Study of Digital Transmitter
4. Study of AM modulation.
5 Study of FM modulation
6 Study of angle modulation
7 Study of PCM modulation
8 Study of different types Receivers
9. Two Experiments using MATLAB.

Reference Books:

1. Modern Digital and Analog Communication systems B.P. Lathi, 3rd Edition, Oxford University Press 1998.
2. Communication Electronics, L.F. Frangel, Tata McGraw Hill 2002
3. Contemporary Communication systems using MATLAB, J.G. Proakis, Salahi