Solapur University, Solapur.

Structure of TE Electrical and Electronics Engineering

w.e.f. Academic Year 2011-12

TE (Electrical and Electronics Engineering) Part-I

Sr No	Subject	Teaching Scheme			Examination Scheme\				
		L	P*	T	TH	TW	POE	OE	Total
1	Electromagnetic Engineering	4	--	1	100	25	--	--	125
2	Electric power generation and utilization	4	---	----	100	25	----	--	125
3	Micro Processor	4	2	---	100	25	50	--	175
4	Digital Signal Processing	4	2	----	100	25	25	--	150
5	Feed back control system	4	2	1	100	25	25	--	150
6	Mini hardware Project	----	2	--	--	25	--	--	25
	Total	20	08	02	500	150	100	--	750

TE (Electrical and Electronics Engineering) Part-II

Sr No	Subject	Teaching Scheme			Examination Scheme				
		L	P *	T	TH	TW	POE	OE	Total
1	Power Electronics	4	2	---	100	25	50	--	175
2	Electronic Communication Engineering	4	2	--	100	25	--	--	125
3	Power system I	4	2	--	100	25	--	25	150
4	Non Linear & Digital Control System	4	2	--	100	25	--	--	125
5	Microcontroller & Its Applications	4	2	--	100	25	50	--	175
	Total	20	10	--	500	125	100	25	750

Note:

1) The batch size for the practical's/tutorials be of 15 students. On forming the batches, if the strength of remaining students exceeds 7, then a new batch may be formed.

2) Vocational Training (to be evaluated at B.E. Part-I) of minimum 15 days should be completed in any vacation after S.E. Part-II but before B.E. Part-I & the report should be submitted in B.E. Part-I.

T.E. (Electrical & Electronics) Engg. – Part I

1. Electromagnetic Engineering

Teaching Scheme:
Lecture: 4 Hours /week
Tutorial: 1Hour/week

Examination Scheme:
Paper : 100 Marks
Term Work: 25 Marks

SECTION I

1. Electrostatics (7 Hrs)
Scalars & vectors, vector algebra, vector components & vectors, vector field, Dot & cross products, The Cartesian, cylindrical & spherical coordinate systems, Coulomb's law & Electric field intensity, Electric field due to continuous line charge, sheet of charge & voltage charge distribution. Streamlines & sketches of fields

2. Electric Flux density-Gauss law & Potential (7 Hrs)
Gauss law & its applications to some symmetrical charge distribution & differential volume element, divergence, Maxwell's first equation, the vector operator & the Divergence theorem, Energy & potential energy expended in moving a point charge in an electric field, Line integral, potential difference & potential, potential gradient, potential field of a point charge & system of a charges, dipole, energy density in electrostatic field.

3. Conductors, Capacitance Laplace & Poisson's Equation (6 Hrs)
Current & current density, Continuity of current, Conductor properties & boundary conditions, nature of dielectric, boundary conditions for perfect dielectric, capacitances, Poisson's & Laplace equations. Uniqueness Theorem, Product solution of Poisson's & Laplace equations

SECTION-II

4. Steady Magnetic Fields (7 Hrs)
Biot-Savart law, Ampere circuital law, Curl Stake's theorem, Magnetic field & Magnetic flux density, scalar & vector magnetic potentials

5. Magnetic Forces & Inductance (6 Hrs)
Force on a moving charge, force between differential current element & torque on a closed circuit, nature of magnetic materials, magnetic boundary conditions, self & mutual induction

6. Time Varying Fields (7 Hrs)
Faraday's laws on moving charge due to electric & magnetic fields, Maxwell's equations in point from, integral form for static & time varying fields, harmonically time varying fields, Physical significance of Maxwell's equations, Plane electromagnetic waves in space in pure & lossy dielectric media.

Recommended Books:-

1. Electromagnetic Engineering by W. Hayt, McGraw Hill, 7th Ed
2. Field wave Electromagnetic by David Cheng, Pearson Education
3. Electromagnetic Field by K B Madhu Sahu, 2nd Edition, Scitech
4. Electromagnetic Fields Theory and Problems by TVS Arun Murthy, S Chand
5. Schaum's series in Electromagnetic- Edminister, McGraw Hill, 2nd Ed
6. Electromagnetism -A. Pramanik, PHI
7. Elements of Electromagnetics -Matthew Sadiku, Oxford 3rd Ed
8. Electromagnetics with Applications- Kraus Heisch, McGraw Hill, 5th Ed
9. Fundamentals of Applied Electromagnetics- F.J. Ulaby, PHI
10. Antenna for all Application- John D Kraus,third edition- TMH publication
11. Electromagnetic Waves and Radiation Systems - Jordan and Balmain PHI publ.

Term-work
Term-work shall consist of at least one tutorial/ assignments/ simulation per topic covering the syllabus.

T.E. (Electrical & Electronics) Engg. – Part I

2. Electric Power generation & utilization

Teaching Scheme: **Examination Scheme:**
Lecture: 4 Hours /week Paper: 100 Marks
Term Work: 25 Marks

SECTION – I

1. Introduction to Power plant Economics and Tariffs (Part-1): (5 Hours)
Hydroelectric generation:
Hydrology, run off and stream flow, hydrograph, flow duration curve, mass curve, reservoir capacity, dam storage reservoir, surge tank, penstock, spillway, tail race. Classification of hydroelectric plants on the basis of head, advantages and disadvantages of low, medium and high head plants, pumped storage plants types and their advantages, different types of water-turbines, layout of different types of hydro power plants.(No numericals).

2. Introduction to Power plant Economics and Tariffs (Part-2): (5 Hours)
Nuclear power generation:
Principle of nuclear power generation, nuclear fission and fusion processes, materials used as nuclear fuel. Nuclear reactor. Main parts of reactor and their functions, classification construction and operation of reactors such as boiling water reactor, pressurized water reactor, heavy water cooled and moderated (CANDU) type reactor, gas cooled reactor and liquid metal cooled reactor.

3. Recent trends in electrical power generation: (4 Hours)
General layout and operating principle of wind power plant, tidal power plant, geothermal power plant, solar power plants and fuel cells. Comparison of these plants on the basis of installation cost, running cost, reliability and environmental effects.

4. Supply requirements of generating station: (6 Hours)
Types of loads – residential, industrial, commercial, traction, irrigation loads, variation of these load demands, various factors affecting generation such as maximum demand, average demand, demand factor, diversity factor. Total load demand and its variation, chronological load curve, load duration curve, energy load curve, mass curve, plant capacity factor and plant load factor.

SECTION – II

5. Types of distribution systems: (4Hours)
Radial, ring main, interconnected, parallel feeder, primary and secondary system, overhead and underground, testing of underground cable distribution systems

6. Electrical heating: (5 Hours)
Classification of electrical heating, resistance ovens, design of heating element (Numericals), Direct and indirect arc furnaces, coreless and core type induction furnaces, high frequency induction heating, Dielectric heating, applications of various types of heating.

7. Electric welding: (5 Hours)
Various types of electric welding (arc, butt, spot, seam, flash), welding transformer, Power supply and control of electric welding. Applications of various types of welding.

8. Electric traction: (6 Hours)

Traction system, steam engine drive, IC engine drive, electric drive, diesel electric traction, battery drivers, mechanics of train movements, speed–time curves for different services, trapezoidal & quadrilateral speed–time curves average and schedule speed, calculations of tractive effort, specific energy consumption for given run, effects of varying acceleration, adhesive weight & braking retardation, Coefficient of adhesion.

Reference Books:

1. M. V. Deshpande, "Elements of Electric Power Station Design", Wheeler Publishing Co.
2. B. R. Gupta, "Generation of Electrical Energy", Eurasa Publishing House.
3. B. G. A. Skrotzki & W. A. Vopat, "Power Station Engineering and Economy", Tata McGraw Hill. 22nd edition 2002
4. S. L. Uppal, "Electrical Power", Khanna Publishers. 13th edition 2003
5. M. L. Soni, P. V. Gupta and U. S. Bhatnagar, "A Course in Electrical Power", Dhanpat Rai & Sons, 1st edition 2005

T.E. (Electrical & Electronics) Engg. – Part I

3. Microprocessor

Teaching Scheme:
Lecture: 4 Hours /week
Practical: 2Hour/week

Examination Scheme:
Paper : 100 Marks
Term Work: 25 Marks
POE: 50 Marks

1. Architecture of Intel 8085 microprocessor: (8 hrs)
Architecture of Intel 8085 microprocessor, functional PIN diagram, ALU, Instruction register-decoder, Timing and control, general purpose registers, Data & Address bus, Addressing modes, Instruction set of 8085

2. Programming & Timing diagrams: (6 hrs)
Assembly language programming, subroutines, use of delay routine and display routine, stack operations. Instruction cycle, machine cycle, fetch cycle, execution cycle, WAIT, HALT, RESET, timing diagrams. Single stepping.

3. Memory & I/O interface: (6 hrs)
RAM, ROM, EPROM, memory chips, memory organization and addressing techniques, EPROM programming and erasing, Memory mapped I/O, I/O mapped I/O, I/O instructions, Data transfer techniques, interrupt driven I/O software and hardware interrupts for 8085

SECTION-II

4. Peripheral chips: (7 hrs)
Schematic block diagrams, operating modes and interfacing techniques, assembly language programs for interfacing of chips 8255, 8254,8259 with 8085 (Detailed study expected)

5. Data Converters and Interfacing: (4 hrs)
DAC weighted resistor and resistor ladder DAC, Dual slope ADC, ADC-Successive approximation, Interfacing ADC 0808/0809, DAC 0808 with 8085.

6. Serial I/O & Data Communication: (5 hrs)
Concept of serial I/O, Synchronous & Asynchronous I/O, 8085 serial I/O lines SOD, SID, 8251 USART-Schematic block diagram, features and general operation of the chips in brief.

7. Applications of 8085: (4 hrs)
a) Measurement of Voltage, current, frequency and power factor.
b) Over current relay operation
c) DC motor speed control
d) Temperature control

Books:

1. Douglas V.Hall, “Microprocessors and Digital Systems”, 2nd Edition, Tata Mc-Graw Hill.
2. Ramesh Gaonkar, “Microprocessor Architecture Programming and Application with 8085”, 5th Edition, Penram International Publishing India.
3. K. Udaya Kumar, B.S. Umashankar, “The 8085 Microprocessor Architecture, Programming and Interfacing”, Pearson
4. Vibhute & Borole “8 bit Microprocessor” Tech Max publications

5. Intel data sheets
6. Micro processor and micro controller by B. Ram, Dhanpat Rai & co. publication 5th edition.
7. Micro processor architecture, programming and system featuring8085 by William A Rout, Cengage learning publication.

Term work: Minimum 08 to 10 experiments based on the details given below with at least 3 experiments based on interfacing and peripherals.

List of Experiments:

1] Addition and subtraction of 32 bit numbers.
2] Subtraction of signed 16 bit numbers.
3] Multiplication and division of 8 bit numbers using add and shift method.
4] Arranging ten numbers in ascending and descending order.
5] Implementation of 4 digits BCD Up down counter.
6] 4 X 4 key board interface using 8255.
7] Program based on 0808 ADC.
8] Program based on 0809 DAC
9] Write a program to handle RST 7.5 interrupt.
10] To study 8259 PIC.
11] To perform experiment on 8251/8257.
12] Interfacing 7 segment display using 8255.
13] Interfacing of stepper motor.
14] Multiplexed Display interface using 8255.
15] Binary to BCD, BCD to Binary conversion.

T.E. (Electrical & Electronics) Engg. – Part I

4. Digital signal Processing

Teaching Scheme:
Lecture: 4 Hours /week
Practical: 2Hour/week

Examination Scheme:
Paper: 100 Marks
Term Work: 25 Marks
POE: 25 Marks

SECTION – I

1. Introduction:- **(2 Hours)**

DSP System concept, DT signals, co-relation of DT signals.

2.The Discrete Fourier transform and Fast Fourier Transform:- **(10Hours)**
DFT, Relation between DFT and Z Transform, Properties of DFT, Circular convolution, Fast convolution techniques (Overlap add and overlap save), Frequency analysis of signals using DFT, FFT Algorithms (DIT FFT and DIF FFT)

3. Realization of Digital Linear systems:- **(8 Hours)**
Structures for realization of Discrete time systems, Structures for FIR Filters: Direct form, Cascade form & Lattice Structure. Structures for IIR filters: Direct form, Signal flow graph & transposed structure, cascade form and parallel form.

SECTION – II

4. IIR and FIR filters design:- **(10 Hours)**
Impulse Invariant technique, Bilinear transformation, Analog Filter approximation (Butterworth), Linear phase FIR filter, Frequency sampling method of filter design, FIR filter design by Windows, Implementation of IIR filters & FIR filter.

5. Introduction to programmable Digital Signal Processors:- **(6 Hrs)**
Basic Architectural features, multiply and accumulate (MAC) unit, Bus Architectures, VLIW Architecture, Special addressing modes, fixed point and Floating point Digital signal processors overview of TMS320C54XX DSP Architecture

6. Applications of DSP:- **(4 Hrs)**
Applications of DSP in power systems: measurement of electrical quantities, Power system Protection, state estimation etc., Applications of DSP for data compression, array processing and in Control System.

Reference Books:

1. Digital Signal Processing – Principles, Algorithms and Applications by John G Proakies Pearson Education
2. Digital Signal Processing – A Practical Approach by Ifeachor E.C. & Jervis B. W. -Pearson Education
3. Digital Signal Processing by Ramesh Babu -4th Edition Scientic Publication
4. Digital Signal Processing by S Salivahanan, A Vallavaraj & C Gnanapriya –TMH
5. Digital Signal Processors- Architecture, Programming and Applications by B Venkataramani & M. Bhaskar-TMH
6. Scientist and Engineers Guide on Digital Signal Processing

7. Discrete time signal Processing by A.V. Oppenheim & R.W. Schalfer.- John Wiley
8. Digital Signal Processing – A System Design approach by D.J. Defata- John Wiley
9. Digital Signal Processing Fundamentals Applications by Li Tan- Academic Press
10. Digital Signal Processing by M.H.Hyes.-(Schaums Outline) TMH
11. Fundamental of DSP using Mat lab by Schilling-Cengage learning

List of Experiments:

Minimum 8 Experiments Based on the above Syllabus.
Experiments may be performed using MATLAB/ Lab VIEW/ DSP simulator

1. Generation of CT & DT signals
2. Convolution and correlation of signals
3. Computation of DFT & IDFT using standard formula
4. Computation of DFT using FFT algorithms
5. Computation of circular convolution
6. Design of FIR (LPF,HPF,BPF,BRF) filter using Fourier series method
7. Design of FIR (LPF,HPF,BPF,BRF) filter using frequency sampling method
8. Design of FIR filter using any window technique (for e.g. Kaiser Window).
9. Design of IIR (LPF, HPF, BPF, BRF) filter using Impulse Invariance method.
10. Design of IIR (LPF, HPF, BPF, BRF) filter using Bilinear Transformation method.
11. Fast convolution technique by using overlap adds method.
12. Fast convolution technique by using overlap save method.
13. Realization for FIR/IIR filter structure (Any one method).

T.E. (Electrical & Electronics) Engg. – Part I

5. Feedback Control Systems

Teaching Scheme:	**Examination Scheme:**
Lecture: 4 Hours /week	Paper : 100 Marks
Practical: 2Hour/week	Term Work: 25 Marks
Tutorial: 1Hour/week	POE: 25 Marks

SECTION – I

1. Introduction to Feedback Control System (8 Hrs.)

Classification of control System, Mathematical models of physical system- Electrical & Mechanical System, Transfer function, Deriving transfer function of physical system - field controlled and armature controlled DC servo motors, Block diagrams and reduction techniques including signal flow graphs.

2. Feedback characteristics of Control system (5 Hrs.)

Open loop and closed loop control systems, Reduction of parameter variations by use of feedback, control over system dynamics by use of feedback, control of effect of disturbance signals by use of feedback, linearzing effect of feedback, Regenerative feedback.

3. Time Domain Analysis (7 Hrs.)

Time response of first order & second order system using standard test signal, steady state errors and error constants, Root locus techniques- Basic concept, rules for construction of Root Locus, application of root locus techniques for control system.

SECTION – II

4. Frequency Domain Analysis (9 Hrs.)

Introduction, correlation between time & frequency domain, Bode plots, minimum phase function, gain margin, phase margin, effect of addition of poles & zeros on bode plots, Polar plots, Nyquist stability criterion.

5. Analysis of control system in state space (5 Hrs.)

Basic concepts of state, state variable & state models, controllability, observability, Derivation of Transfer Function from state model for continuous time system

6. Compensators & controllers (6 Hrs.)

Need of compensation, lead compensation, lag compensation, Lead-lag compensation. Controllers- Introduction, Proportional, Integral, derivative & PID controllers, Introduction to PLC

Reference Books:

1. I.J. Nagrath, M.Gopal “Control Systems Engineering”, 5th Edition, New Age International Publication
2. Schaums Series book “Feed back Control Systems”.
3. Les Fenical “Control Systems”, 1st Edition, Cengage Learning India.
4. R. Anandanatarajan, P. Ramesh Babu , “Control Systems Engineering”, Scitech Publications
5. Norman S. Nise “Control Systems Engineering”, 4th edition, Wiley edition.
6. Samarjeet Ghosh, “Control Systems Theory & Applications”, 1st edition, Pearson education.
7. S.K. Bhattacharya, “Control Systems Engineering”, 1st edition, Pearson education.
8. Hackworth, “Programmable Logic Controller”, 1st edition, Pearson education.

List of Experiments:

Hardware based experiments:

1. Potentiometer as transducer and error detector.
2. To verify synchro as a transducer and error detector.
3. A.C. position control system.
4. Determination of transfer functions of physical system.
5. Transient response of second order system for a step input.

6. Verification of Bode plot using Lead Network.
7. To obtain unit step response of second order system using R, L & C
8. Frequency response of control system.
9. Response of PID controller.
10. Study of PLC.

Software based experiments using MATLAB:

1. Transient response of second order system by using standard test signals.
2. Draw a root locus of any system.
3. Draw a Bode Plot.
4. Draw a Polar Plot.
5. Draw a Nyquist Plot.
6. Obtain a transfer function from state space model.
7. Check the controllability and Observability of system.

Total 8 experiments out of which 5 should be hardware based and 3 simulation type.

T.E. (Electrical & Electronics) Engg. – Part I

6. Mini Project

Teaching Scheme:	**Examination Scheme:**
Practical: 2Hour/week	Term Work: 25 Marks

A group of **maximum 03 students** should work together to design, fabricate, test or simulate a hardware project in the field of analog & digital systems, microprocessors, electrical & electronics measurement and instrumentation, electrical machines.

Students should submit a detailed report on their project for term work. The term work assessment should be based on following five points:

1) Student's involvement
2) Aesthetics of the hardware
3) Working status & usefulness
4) Quality of report
5) Attendance & overall knowledge

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T.E. Electrical & Electronics Engineering Part-II

1. POWER ELECTRONICS

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

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

SECTION-I

1. Silicon Controlled Rectifier, TRIAC & DIAC: (9hrs)

Construction, V-I characteristics, Dynamic Characteristic, Gate Characteristic, Ratings, Protection of SCR for over voltage, over current, dv/dt, di/dt, Firing circuit for SCR- R, RC, UJT and Digital firing circuit with optical isolation, commutation circuit for SCR, Construction, characteristics, Rating and Application of DIAC, TRIAC.

2. Power Semi-conductor Devices: (4hrs)

Construction, working, Rating and application of power diodes, MOSFET, IGBT, GTO.

3. Thyristor Application: (5 hrs)

- Switched mode power supplies
- Uninterruptible power supplies
- ARC Welding

4. Phase Controlled Rectifier: (5 hrs)

Half wave & full wave controlled Rectifier with R and R-L load (with and without flywheel diode), effect of inductance on performance of controlled Rectifier Half controlled & fully controlled bridge rectifier with R & R-L load (with and without flywheel diode)

SECTION-II

5. Choppers: (8hrs.)

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

6. Cycloconverter: (7hrs.)

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 Cycloconverter.

7. Inverter: (8 hrs)

Principle of operation, performance parameters, current source inverter, voltage source inverter, 1 phase bridge inverter, 3 phase inverter, voltage controlled technique, harmonic reduction

Recommended 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. Power Electronics by M D Singh, K B Khanchandani, MCGraw Hill, 2nd Edition

Term work:

It should consist of minimum 8 experiments based on above syllabus. The following list is given for reference.

List of Experiments:

1. Verification of SCR, DIAC, TRIAC characteristic.
2. Verification of IGBT characteristic.
3. Verification of Half & Full Control rectifier.
4. Verification of Half & Full bridge inverter. (1-ph)
5. Verification of Johne's Chopper circuit.
6. Verification of Step up Chopper circuit.
7. Verification of Step down Chopper circuit.
8. Verification of series Inverter circuit.
9. Verification of parallel Inverter circuit.
10. Cycloconverter feeding Resistive load

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T.E. Electrical & Electronics Engineering Part-II

2. Electronic Communication Engineering

Teaching Scheme: **Examination Scheme:**
Lecture: 4 Hours /week **Paper : 100 Marks**
Practical: 2 Hours/Week **Term Work: 25 Marks**

SECTION – I

1. Review of Signals & Introduction to Communication Systems: (8 hrs.)
Signal, Size of a signal, classification of signals, signal operations, signals and vectors, correlation, Overview of electrical communication, classification of communication systems, necessity of modulation, Baseband & carrier communication.

2. Amplitude Modulation & Demodulation: (8 hrs.)
Graphical representation & Mathematical equation of AM wave, bandwidth of AM waves, case study of amplitude modulation systems – SSB, DSB, SSBSC, SSBFC, DSBSC, Carrier acquisition & demodulation, super heterodyne AM receiver, TRF receiver, VSB transmission and television system

3. Frequency Modulation & Demodulation: (7 hrs.)
Concept of instantaneous frequency & frequency modulation, band-width of angle modulated waves, generation of FM waves, demodulation of FM, Interference in angle modulated systems, FM transmitter & receiver, concept of pre-emphasis & de-emphasis

SECTION – II

4. Sampling and Pulse Code Modulation: (7 hrs.)
Sampling theorem, aliasing, quantization & analog to digital conversion, pulse code modulation and demodulation, delta modulation and demodulation, adaptive delta modulation and demodulation

5. Concept of Digital Data Transmission: (8 hrs.)
Basic digital communication system - line coding, pulse shaping, scrambler, regenerative repeater, digital coding systems – linear block codes & hamming codes (Numerical treatment), detection-error, probability, M-array communication, digital carrier systems digital multiplexing.

6. Probability: (8 hrs.)
Probability, Random variable, probability density, mean, moments, transformation of random variables, stationary Process, mean, autocorrelation and covariance functions, periodicity, power spectral density, response of linear systems to random signals, Gaussian distribution, central limit theorem

Recommended 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. Electronics Communication Systems – Kennedy, Davis
4. Taub & Schilling "Principles of communication systems" TMH
5. Simon Haykin "Communication Systems" John Wiley & Sons

Term Work

It should consist of minimum 8 experiments based on above syllabus. The following list is given for reference.

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.

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T.E. Electrical & Electronics Engineering Part-II

3. Power System I

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

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

SECTION - I

1.Introduction of Power System: **(6hrs.)**

Introduction, Electric supply system, typical AC Electrical power system, comparison between DC & AC system for transmission and distribution, Comparison between overhead & underground system, Choice of working voltage for transmission line, Economic size of line conductor

2. Mechanical Design Of Overhead Lines: **(8hrs.)**

Introduction, Main components of overhead lines, Line supports, Conductor materials, Cross-arms, Guys & Stays, Conductor configuration, Spacing, Clearance, Span lengths, Sag & Tension, Vibrations & Dampers

3 Overhead Transmission Line parameters: **(8 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.

SECTION – II

4. Overhead Line Insulators & Corona: **(6 hrs)**

Types of Insulators, string efficiency ,Methods of improving String efficiency, Arcing horn, grading ring of insulators, Corona, factor affecting corona, Advantages & disadvantages of corona, dielectric strength of air & disruptive critical voltage, visual critical voltage, corona power loss, methods of reducing corona effect; sag in over head lines and sag calculations

5. Characteristics and Performance of Transmission Line: **(8hrs)**

Classification of Overhead transmission lines ,Short, medium and long lines, End condenser method, Nominal T-method, Nominal π-method. Voltages and currents at sending and receiving end of line, ABCD constants, Sending end and receiving power circle diagrams, Ferranti effect, methods of voltage control, voltage regulators, tap changing transformers, booster transformers, synchronous phase modifiers)

6. Underground Cables: **(8 hrs)**

General construction of cables, Requirements of cables, Cable conductors, insulating materials for cables, classification of cables, Insulation resistance of a single core cables, Capacitance of single core cables. Dielectric stress in a single core cable, most economical diameter conductor, Grading of cables, Capacitance of three core belted type cables, Measurement of insulation resistance of cables, heating of cables, Thermal resistance of cables, Selection of cables

7.Power Factor Improvement :- **(2 hrs)**

Power factor, Causes of low power factor, Methods of p.f. improvements, Economics of p.f. improvements

Recommended Books:-

1. A course in Electrical Power by J.B. Gupta, S K Kataria and Sons, 1st edition
2. Principle of Power System by V. K. Mehta, Rohit Gupta, S. Chand Publication, 4th edition
3. Power System Engineering by M L Soni, P V Gupta, U S Bhatnagar, A Chakrabarti, Dhanpat Rai & Co
4. Electrical Power by Dr. S.L. Uppal, Khanna Publishers, 13th Edition
5. Electrical Power System by Ashfaq Husain, CBS, 5th Edition
6. Elements of Power Systems Analysis- William D. Stevenson. Jr., MCGraw Hill, 4th Edition

Term Work:

Term work should consist of drawing sheets based on above theory.

Note : Two to Three Industrial (Power Sector) visits to be completed in the semester.

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T.E. Electrical & Electronics Engineering Part-II

4. Non Linear & Digital Control System

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

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

SECTION-I

1. Design of compensator using Root Locus: (7 hrs)
Introduction of design problem, Approach & preliminary considerations, Design of lead, lag & lag-lead compensators, compensation

2. Design of compensator using Frequency response: (8 hrs)
Transient response through gain adjustment, lag compensation, lead compensation, lag-lead compensation

3. State-Space Analysis & Design: (8 hrs)
Concept of state, state variable & state model, state-space representation of transfer function system, Invariance of Eigen values, solution of state equations. Controllability & observability, Pole placement by feedback

SECTION-II

4. Non-linear Control Systems: (7 hrs)
Different types of non-linearties, Phase plane method. Singular points, Stability of Nonlinear Systems construction of phase trajectories Definition & deviation of Describing functions

5. Discrete-time Control System: (8 hrs)
Basic elements of discrete data control system & its advantages over the continuous time system. A/D and D/A conversion, Sample & hold device, Pulse transfer function of cascaded elements, Pulse transfer function of closed loop system & Digital controller.

6. Design of Discrete-time Control System:- (8 hrs)
Mapping between s-plane & z-plane, stability analysis of closed loop systems in z-plane Transient & steady state response analysis Design based on the Root Locus method.

Recommended Books:-

1. Modern Control Engineering- K.Ogata, Prentice Hall India, 4th Ed
2. Control System Engineering- IJ Nagrath & M Gopal New Age Publishers 5th Ed.
3. Discrete-time Control Systems by K Ogata, Prentice Hall India, 2nd Ed
4. Continuous and Discrete Control System by John F. Dorsey-TMH (IE)

Term-Work:-
Term-work shall consist of hardware experiments & simulations based on above topics.

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T.E.Electrical & Electronics Engineering Part-II

5. Microcontroller & Its Applications

Teaching Scheme:
Lecture: 4 Hours /week
Practical: 2Hour/week

Examination Scheme:
Paper: 100 Marks
Term Work: 25 Marks
POE: 50 Marks

SECTION I

1. 8051 Architecture: (8 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: (8 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: (8 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: (8 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: (8 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): (8 hrs.)
Microcontroller based automatic power factor control relay, solid state energy meter using ASIC, weighing balance, serial EEPROM interfacing, temperature indicator and controller, Real time clock using DS1307.

Term Work:
Minimum 8 experiments should be performed based on above syllabi. Experiments should be based on assembly language programming (hardware and simulator) and on real world interfacing.

Recommended Books:

1.The 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)