Solapur University, Solapur
Structure of T.E. (Electrical Engineering) Part-I &II
w.e.f. Acadamic Year 2009-2010

TE (Electrical Engg.) Part-I

Sr. No	Subject	Teaching Scheme				Examination Scheme				
		L	P	T	Total	T	TW	POE	OE	Total
1	Power System-I	4	2	--	6	100	25	--	25	150
2	Linear Integrated Circuit	4	2	--	6	100	25	25	--	150
3	Electromagnetic Engg.	3	--	1	4	100	25	--	--	125
4	Control System-I	4	2	--	6	100	25	25	--	150
5	Instrumentation Technique	4	2	--	6	100	25	--	--	125
6	Energy Management System	2	--	--	2	50	--	--	--	50
	Total	21	8	1	30	550	125	50	25	750

TE (Electrical Engg.) Part-II

Sr. No	Subject	Teaching Scheme				Examination Scheme				
		L	P	T	Total	T	TW	POE	OE	Total
1	Power System-II	3	2	--	5	100	25	--	25	150
2	Control System-II	4	2	--	6	100	25	--	--	125
3	Microprocessor & Application	4	2	--	6	100	25	50	--	175
4	Power Electronics	4	2	--	6	100	25	25	--	150
5	Engg. Economics & Industrial Management	3	--	--	3	100	25	--	--	125
6	Utilization of Electrical Energy & Energy Conservation	3	--	1	4	100	25	--	--	125
	Total	21	8	1	30	600	150	75	25	850

Note:-
1. **Batch size for the Practical/Tutorial shall be of 15 students. On forming the batches, if the strength of remaining students exceeds 7, then a new batch shall be formed.**
2. **Vacational Training (evaluated at B.E. Part-I) of minimum 15 days shall be completed in any vacation after S.E. Part-II but before B.E. Part-I & the report shall be submitted and evaluated in B.E. Part-I**

Solapur University, Solapur

T.E. (Electrical) Engineering Part-I

POWER SYSTEM-I

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

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

SECTION-I

1. Power System:- **(4 Hrs)**
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, Kelvin's law, Comparison of cost of conductors of overhead system

2. Mechanical Design Of Overhead Lines:- **(5 Hrs)**
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 Line Insulators & Corona **(6 Hrs)**
Types of Insulators, 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

4. Transmission Line Parameters:- **(6 Hrs)**
Line resistance, skin effect, line inductance, inductance of 3-phase overhead line, Line capacitance, capacitance of 3-phase overhead line, Transposition of 3-phase lines, Bundled conductors, Proximity effects, capacitance of transmission lines, Electric field & Potential difference, Capacitance of 1-phase & 3-phase overhead lines, Effect of earth on the capacitance of overhead

SECTION-II

5. Performance of Transmission Line:- **(7 Hrs)**
Classification of Overhead transmission lines, Important terms performance of 1-phase short transmission lines, 3-phase short transmission lines, Effect of load power factor on regulation & efficiency, Medium transmission lines, End condenser method, Nominal T-method, Nominal π-method, Long transmission lines, Generalized constants of a transmission line, Determination of generalized constants of transmission lines

6. Underground Cables:- (6 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. Distribution System:- (5 Hrs)

Classification & types of DC distribution system, Types of loading, DC distributor fed at one end & at both ends, Ring main distributor, 3-wire DC distribution system, AC distribution & calculation, AC distributed with concentrated loads, AC interconnected network system, 3-phase 4-wire star connected unbalance load circuit
Primary and secondary distribution with voltage levels, design criterion, Redial primary circuit, Ring main System, loop primary circuit, General protection used on redial feeders, Voltage drops in AC distribution

8. Economic Consideration:- (5 Hrs)

Classification of cost, cost analysis of power plant, economics of power generation, Significance load factor & diversity factor, Load sharing between Base load & Peak load plants, Types of tariff & characteristics, Types of consumers & their tariff, 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. Electrical Power Systems by C L Wadhwa, New Age International Publisher
3. Electric Power Transmission and Distribution by S Sivangaruja, S Satyanarayna, Pearson Education
4. Principle of Power System by V. K. Mehta, Rohit Gupta, S. Chand Publication, 4th edition
5. Power System Engineering by M L Soni, P V Gupta, U S Bhatnagar, A Chakrabarti, Dhanpat Rai & Co
6. Electrical Power by Dr. S.L. Uppal, Khanna Publishers, 13th Edition
7. Electrical Power System by Ashfaq Husain, CBS, 5th Edition
8. Electric Power Distribution & Transmission, Lvces M. Faulkenberry, Walter Coffer, Pearson Education Publication
9. Elements of Power Systems Analysis- William D. Stevenson. Jr., MCGraw Hill, 4th Edition

Term-Work:-

1. Minimum 5-6 drawings sheets based on the above syllabus.
2. **One visit to substation related to syllabus and report based on it.**

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T.E. (Electrical) Engineering Part-I

LINEAR INTEGRATED CIRCUIT

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

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

SECTION-I

1. Operation Amplifier:- (5hrs)
Block diagram differential Amplifier, Analysis concept of active loads, level shifter output terminals & packaging characteristics of op-amp

2. Static & Dynamic op-amp limitation:- (5hrs)
Input bias & offset currents input offset voltage. Input offset- error compensation, transient response, noise lew rate, frequency compensation, measurement of op-amp parameters

3. Linear Op-Amp circuits:- (7hrs)
Inverting & non-inverting amplifier, summing amplifier, differential amplifiers, instrumentation amplifier & its application, V to I converters, I to V converters & its application

4. Non-linear Op-Amp circuits:- (7hrs)
Differentiator, Integrator, comparators & its characteristics, Schmitt trigger, window detector, peak detector precision rectifiers, log/antilog amplifier

SECTION-II

5. Active filters & Oscillators:- (8hrs)
Low pass & high pass butter worth filter band pass filters, band reject filters, all pass filters, phase shift & win bridge oscillators, square wave & generator, triangular & saw tooth wave generator

6. Specialized ICs & their applications:- (6hrs)
IC555 timer, block schematics & its applications such as astable & monostable multivibrators, VCO-PLL block schematic, operating principle, IC565 & its applications such as FM detector AM detector, frequency synthesizer etc. V/F & F/V converters, Audio amplifier LM380

7. Voltage regulators:- (6hrs)
Fixed volt regulators (IC78xx, 79xx), adjustable volt regulators, (M317, 337), Precision volt regulator (IC723) low high voltage current boosting etc. dual tracking regulator.

8. Industrial application of op-amp: -   (4hrs)
1. As controllers- P, PI, PD, PID
2. ON-OFF controller

Recommended Books:-

1. Op-amps & linear integrated circuits- Ramakant A. Gayakwad, Pearson Education 4th edition
2. Linear Integrated Circuits by T R Ganesh Babu, B Suseela, 3rd Edition, Scitech
3. Linear Integrated Circuits by S P Bali, MCGraw Hill
4. Integrated circuits by K.R. Botkar, Khanna Publisher, 10th Edition
5**.** Design with op-amps & analog ICS by Sergio Franco, McGraw Hill, 10th edition
6. Op-amps & linear integrated circuits by Coughlin & Wriscoll, PHI, 6th edition
7. Analysis & Design of Analog ICS- P.R. Gray & R.G.Meyer.
8. Linear Integrated Circuits by Salivahanan by V S Kanchana Bhaskaran, McGraw Hill

Term-work:-

Term-work shall consist of 8 experiments from list mentioned below & at least 3 assignments on the syllabus.

List of Experiments:-
1. Measurement of op-amp parameters
2. Inverting / non-inverting amplifier
3. Adder / subs tractor
4. Square wave sinusoidal oscillator
5. Comparator / Schmitt trigger
6. precision rectifiers
7. LP/HP filter
8. voltage regulator using IC 723
9. Astable / mono-stable multi-vibrator using IC 555
10. VCO using IC 555
11. Study of audio amplifier LM 380
12. IC 565 application- anyone

Solapur University, Solapur

T.E. (Electrical) Engineering Part-I

ELECTROMAGNETIC ENGINEERING

Teaching Scheme: **Examination Scheme:**
Lectures: 3 Hours /Week   **Paper: 100 Marks**
Tutorial: 1 Hours/Week   **T.W.: 25 Marks**

SECTION-I

1. Vector Analysis:-   **(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 Stoke'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. Shaum'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

Term-work:-

Term-work shall consist of at least 6 tutorials/ assignments/ simulation covering the syllabus

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T.E. (Electrical) Engineering Part-I

CONTROL SYSTEMS-I

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

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

SECTION-I

1. Introduction to Control System:- (4 Hrs)
Definition, basic components & classification of general control system, Open loop & Close loop control systems, advantages & disadvantages, examples, SISO & MIMO Linear systems, Analog & Digital control system

2. Mathematical Models of Physical Systems:- (8 Hrs)
Introduction, Differential equations of physical systems & solutions for these differential equations, Transfer Function of electrical and mechanical systems, electrical analogy of mechanical systems (F-V & F-I), sensors and encoders in control system, synchro, servo mechanism and stepper motor

3. Reduction of Multiple Systems:- (10 Hrs)
Reduction of multiple systems & feedback characteristic, Block diagram, Signal flow Graph (SFG), Conversion of Block diagram to SFG. Mason's Gain formula and its application for SFG, Definition of sensitivity, effect of feedback on system parameter variation, system dynamics & disturbance signal. Positive & negative feedback

SECTION-II

4. Time-Response Analysis:- (8 Hrs)
Standard test signals, poles, zeros & system response, type & order of system. The response of first order and second order systems, Time response specifications (Steady state errors & definitions of error constants k_P, k_V and k_A) Effect of derivative & integral control on performance of feedback systems

5. Stability & Root Locus Techniques:- (7 Hrs)
Concept of stability & necessary condition, Root-Harwitz criterion with special cases, location of roots in s-plane, concept of root locus diagram, properties and rules for construction of root locus, Determination of stability from root locus

6. Frequency Response Analysis:- (7 Hrs)
Introduction to frequency response of system, polar plot & bode plot for frequency function. Minimum phase function, gain margin & phase margin. Nyquist stability criterion

Recommended Books:-

1. Modern Control Engineering by K. Ogata, Pearson Education, 4th Edition
2. Control System Engineering by R Anandanatrajan, P Ramesh Babu, 2nd Edition, Scitech
3. Control Systems by Les Fenical, Cengage Learning
4. Control System Engineering by SK Bhattacharya, 2nd Edition, Pearson Education
5. Automatic Control Systems by B.C. Kuo, Printice Hall India, 4th Ed.
6. Control System Engineering by Norman S Nise, 4th Edition
7. Control System Engineering by I J Nagrath & M Gopal, New Age International Publishers,5th edition
8. Control Systems Principles & Design by M Gopal, 2nd Ed
9. Modern Control System- R. Bishop & R Dr. Addism Wistey, Pearson Edition (LPE), 8th Ed
10. Feedback Control of Dynamic Systems- G. Franklin, J.D. Powell, A Emami, Pearson Edition, 4th Ed

Term-work:-

Term-work shall consist of 8 experiments out of which 5 should be based on the hardware and 3 should be based on simulation covering the syllabus.

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T.E. (Electrical) Engineering Part-I

INSTRUMENTATION TECHNIQUES

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

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

SECTION-I

1. Introduction:- **(3 hrs)**
Instrumentation system configuration, Brief idea of static characteristics of measuring devices accuracy, precision errors, uncertainties, linearity, resolution

2. Transducers:- **(7 hrs)**
Definition, various types of transducers, variable parameter transducers, selection factors Instrumentation set up for measurement of displacement , velocity & acceleration, strain, pressure & temperature, vibration, flow, angular velocity & torque

3. Signal Conditioning:- **(6 hrs)**
Chopper stabilized amplifier, Instrumentation amplifier, isolation & programmable gain amplifier, active filters, frequency response of 1st order and 2nd order filter, practical comparators, modulators demodulators, sine & other waveform generation, sample and hold circuit, frequency to voltage & voltage to frequency converter

4. Digital Instruments:- **(5 hrs)**
D/A & A/D converters, Data acquisition system, multiplexing, types of multiplexing, universal counter, frequency and time measurement digital voltmeters, Q meter

SECTION-II

5. Data Transmission:- **(8 hrs)**
General telemetering system, types of telemetering system, modulation, different methods of modulation, methods of modulation

6. I/O Devices & Displays:- **(7 hrs)**
Analog display, oscillograph, strip chart, X-Y recorders, Tape recorders, storage oscilloscope, digital I/P & O/p Devices

7. Programmable Logic Controller:- (7 hrs)

Introduction to PLC hardware, CPU memory i/p and o/p, explanation of ladder diagram logic, instrumentation set & types of PLC system, PLC communication & networking, PLC selection & Installation

.Recommended Books:-

1. Electronic Instrumentation- by H.S. Kalsi, Tata McGraw Hill, 2nd edition
2. Elements of Electronic Instrumentation & Measurement by Joseph J Carr, Pearsons Education
3. Electrical & Electronics Measurement – by A.K. Sawhney, Dhanpat Rai & Co (P) Ltd, 18th edition
4. Electrical and Electronic Measurement and Instrumentation by R K Rajput, S Chand
5. Instrumentation Devices & Systems – by Rangan, Mani, Sharma, Tata McGraw Hill, 2nd edition
6. Modern Electronic Instrumentation & Measurement techniques – by Welfrick Cooper, Pearson Education, 2nd edition 2007

Term work:-

Term-work shall consist of 10 experiments out of which 7 should be based on the hardware and 3 should be based on simulation covering the syllabus. Minimum 3 assignments on the syllabus

List of Experiments:-

1. Use of RTD for measurement of temperature.
2. Use of thermistor in control circuit as a temperature compensator.
3. Use of thermocouple as a temperature sensing device.
4. Resistance stain gauge using unbalanced bridge circuit in weighing machine.
5. Use of LVDT transducer for measurement of displacement.
6. Use of function generator for getting different waveforms of different magnitude & different frequencies.
7. Study of IC tester.
8. Measurement of Q-factor by Q-meter.
9. Frequency response of active filters, low-pass, high-pass & band-pass.
10. Application of PLC for a simple control system.

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T.E. (Electrical) Engineering Part-I

ENERGY MANAGEMENT SYSTEMS

Teaching Scheme: **Examination Scheme:**
Lectures: 2 Hours /Week   **Paper: 50 Marks**

1. Global & Indian Energy Scenario:- (6hrs)

Commercial & non-commercial energy, Primary & secondary sources, Commercial energy production, Final energy consumption, Energy needs of growing economy, short term & long term policies. Salient features of Electrical Consumption Bill 2001 & Electricity act 2003. Indian & Global Energy Scenario

2. Energy Management:- (10hrs)

Concept of Energy Management, Concept of power & energy efficiencies, Energy & its various forms, comparison of options, structure of energy management group, energy policy, managerial functions, responsibility & authority, & accountability, supply side management, co-ordination between different energy sources, demand side management, cost of energy, impact of tariff on energy management

3. Energy Audit:- (8hrs)

Definition, need of energy & it types of audit, procedures to follow, data & information analysis, energy consumption- production relationship, pie chart, sankey diagram, cusum technique, least square methods, finding of audit, action plans, bench marking energy performance, energy & audit instruments, report writing

Recommended Books:-

1. Utilization of Electrical Energy by S.C. Tripathi
2. Generation of Electrical Energy by B.R. Gupta, S Chand, 1st Edition
3. Energy Management by Murphy
4. Bureau of energy efficiency by Shikha Arora, Professional book publishers.
5. Preparatory course material for Energy auditor & manager. Govt of India New Delhi

Reference:-

Websites: www.energymanagertraining.com , www.em-ea.org

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T.E. (Electrical) Engineering Part-II

POWER SYSTEM-II

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

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

SECTION-I

1. Representation of Power System Components:- (2 Hrs)
1-phase solution of balanced 3-phase network, single line diagram, impedance/ reactance diagram per system, complex power, advantages of P-V value, representation of load

2. Network Calculations:- (5 Hrs)
Equivalence of sources, Node equations, Matrix partitioning, Node elimination by matrix algebra, the bus admittance & impedance matrices, modification of an existing bus impedance matrix, direct determination of a bus impedance matrix

3. Load Flow Study:- (5 Hrs)
Power flow equations & solution techniques, Gauss-Seidal method, newton-raphson methods, Decoupled & fast Decoupled methods, comparison of load flow methods

4. Power System Stability:- (5 Hrs)
Introduction, Dynamics of synchronous machines, Power angle Equation, Node elimination technique, Simple systems, Steady state stability, Transient stability, Equal area criterion, Numerical solution of swing equation, Multi-machine stability, Some factors affecting, Transient stability

SECTION-II

5. Symmetrical Fault Analysis:- (5 Hrs)
Introduction, Transients on a transmission line, Short circuit of a synchronous machine on no load & loaded condition, Selection of circuit breakers, Algorithms of short circuit studies

6. Symmetrical Components:- (5 Hrs)

Introduction, Symmetrical Component transformation, Phase shift in star-delta transformers, Sequence impedances & sequence networks of transmission lines, synchronous machines & transformers, Constructions of sequence network of a power system.

7. Unsymmetrical Fault Analysis:- (6 Hrs)

Introduction, Symmetrical fault analysis of unsymmetrical faults, Single Line to Ground faults(SLG), Line to Line faults (LL), Double Line to Ground faults(LLG), Open conductor faults, Bus impedance Matrix method for analysis of unsymmetrical shunt faults

Recommended Books:-

1) Elements of Power System analysis by Stevensons, TMH publication, 3rd addition
2) Power System Analysis by S J Nagrath & D B Kothari, TMH publication, 3rd addition, 2003
3) Power System analysis by Hadi Saadat, TMH Publication 3rd Edition 2002
4) Electric Power Transmission & Distribution, S. Sivanagaraju, S. Satyanarayana, Pearson Education publication
5) Electrical Power System by Ashfaq Husain, CBS, 5th Edition

Term-Work:-

Term-work shall consist of 6 Assignments & 4 simulations covering the syllabus.

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T.E. (Electrical) Engineering Part-II

CONTROL SYSTEMS-II

Teaching Scheme: **Examination Scheme:**
Lectures: 4 Hours /Week   **Paper: 100 Marks**
Practical: 2 Hours/Week   **T.W.: 25 Marks**

SECTION-I

1. Design of compensator using Root Locus:-   (6 Hrs)
Introduction of design problem, Approach & preliminary considerations, Design of lead, lag & lag-lead compensators, compensation

2. Design of compensator using Frequency response:-   (7 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:-   (6 Hrs)
Different types of non-linearties, Phase plane method. Singular points, Stability of Non-linear 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:-   (7 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 by R Anandanatrajan, P Ramesh Babu, 2nd Edition, Scitech

3. Control System Engineering- IJ Nagrath & M Gopal New Age Publishers 5th Ed. K.Ogata,
4. Discrete-time Control Systems by K Ogata, Prentice Hall India, 2nd Ed
5. Continuous and Discrete Control System by John F. Dorsey-TMH (IE)
6. Digital Control Systems by B.C. Kuo, Saunders college Publishing, 2nd Ed

Term-Work:-

Term-work shall consist of 5 hardware experiments on topic nuber 1,2 & 5 and 3 based simulations covering the syllabus.

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T.E. (Electrical) Engineering Part-II

MICROPROCESSOR AND IT'S APPLICATIONS

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. 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:- **(7 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:- 8255, 8253/54, 8259 **(7 hrs)**
Schematic block diagrams, operating modes and interfacing techniques, assembly language programs for interfacing of chips 8255, 8253/54,8259 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, serial I/O, 8085 serial I/O lines SOD, SID, 8251 USART-Schematic block diagram, features and general operation of the chips in brief, RS-232C.

7. Applications of 8085 :-   (5 hrs)

  a) Measurement of Voltage, current, frequency and power factor.
  b) Stepper motor control.
  c) Over current relay operation
  d) DC motor speed control
  e) Temperature control
  f) Traffic light control

Recommended Books:-

1. Microprocessors Architecture and Programming Application with 8085 by R S Gaonkar, Penram International Publication Pvt ltd. (MCH), 5th edition.
2. Microprocessor & Peripherals by S P Chaudhari, S R Chaudhari, Scitech Publication
3. Microprocessor & Microcontroller by B. Ram, Dhanpat Rai & Co. Publication, 5th edition.
4. Microprocessors Architecture, Programming and System Featuring 8085 by William A Rout, Cengage Learning Publication

Term work:-

  Minimum 15 experiments as detailed below with minimum 5 experiments based on interfacing and peripherals

List of Experiments:-

  1. Program based on addressing modes, arithmetic and logical instructions
  2. Program based on loops
  3. Program based on code conversion
  4. Program based on 16 bit arithmetic
  5. Program based on multiple pointers
  6. Program based on advanced instructions
  7. Program based on stack and subroutine
  8. Program based on interrupt
  9. Hardware interfacing- static display, dynamic display, stepper motor, DAC, ADC, printer, 8253, 8251

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T.E. (Electrical) Engineering Part-II

POWER ELECTRONICS

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

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

SECTION-I

1. Silicon Controlled Rectifier, TRIAC & DIAC:-   (9 hrs)
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:-   (5 hrs)
Construction, working, Rating and application of power diodes, MOSFET, IGBT, GTO, Power Integrated circuit

3. Phase Controlled Rectifier:-   (6 hrs)
Half wave & full wave controlled Rectifier with R and R-L load (with and without flywheel diode), effect of same inductance on performance of controlled Rectifier
Half controlled & fully controlled bridge rectifier with R & R-L load (with and without flywheel diode)

SECTION-II

4. Chopper:-   (8 hrs)
Principle of operation, Step-up, Step-down, Jone's chopper, Buck, Boost, Buck-Boost & Cuk regulation, Chopper firing circuit, Application of chopper

5. 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

6. Optimizing the utility Interface with Power Electronic system:-   (5 hrs)

Current Harmonics, Power factor, Harmonic standards & Recommended practice, Improved Single phase utility Interface, Improved Three phase utility Interface

7. Thyristor Application:-   **(2 hrs)**
- Switched mode power supplies
- Uninterruptible power supplies
- ARC Welding

Recommended Books:-

1. Power Electronics- Circuit Devices & Application by .Rashid M H, PH Publication, 3rd edition
2. Power Electronics by K Hari Babu, SWcitech Publication, Revised Edition
3. Modern Power Electronics & AC Drive", by Bose B K, Pearson Education
4. Power Electronics by M D Singh, K B Khanchandani, MCGraw Hill, 2nd Edition
5. Power Electronic by Mohan Riobbins, Willey Publication, 3rd edition
6. Elements of Power Electronics by Philip T. Krien, Oxford University Press
7. Power Electronics by V R Moorthi, Oxford University Press
8. Modern Power Electronics by Bose B K, Jacobi Publishers
9. Power Electronics by Vedam Subramanyum, New Age International Pvt. Ltd.

Term work:-

It should consist of minimum 8 experiments. There should be minimum 5 numbers of assignments.

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. . was Verification of series Inverter circuit.
9. Verification of parallel Inverter circuit.

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TE (Electrical) Engineering Part II

Engineering Economics & Industrial Management

Teaching Scheme: **Examination Scheme:**
 Lecture: 3 hours/Week   **Paper: 100 Marks**
                                                                       T.W. :25 Marks

SECTION-I

1. Basics of Economics:-   **(6 hrs)**
 Economics, Economics applied to industries, Payback period, Value Engineering, Make & Buy decisions, Economic Lot (Batch) size, cost control & cost ration

2. Business Organization:-   **(6 hrs)**
Forms/Types of Business organization – Proprietorship, Partnership, Private & Public, Joint stock company, Organization structure & Characteristics – Line & Staff

3. Indian Economy:-   **(4 hrs)**
 Infrastructure in Indian Economy- Energy power, Science & Technology, sector comparative study of five year plans of Indian Economy for electrical sector

SECTION-II

4. Management:-   **(6 hrs)**
 Functions of Management: Planning, organizing, staffing, directing controlling project planning & acquisition, characteristics of project, the project proposal process, project planning Tools, Management Information systems (MIS)

5. SSI & Entrepreneurship:-   **(6 hrs)**
Small Scale Industries – Definition of SSI, Classification, Advantages, Industrial Policies, Steps and procedure for setting SSI, facilities to SSI
 Entrepreneurship- definition, types, functions and qualities, Entrepreneurial Vs managerial Style, Locations and layout , phases in industrial project

6. Industrial Acts & Safety:-   **(4 hrs)**
Indian Factory Act, The Indian Electricity Acts and rules, Industrial Safety

Recommended Books:-

1. Industrial Organization & Engg. Economics By T.R.Banga, S.C.Sharma (Khanna Publishers)
2. Indian Economy By Ruddar Datt, K.P.M. Sundharum (S.Chand Publishers)
3. Industrial Engg & Management by O.P. Khanna, Dhanpatrai & Co, 9th edition
4. Managing Engg. & Technology - Daniel Babcock, PHI, 3rd Edition
5. The Electricity Rules, 2005 Professional Book Publishers, 2008-Edition

Termwork:-

Term work should be minimum six assignments & one case study on each section

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T.E. (Electrical) Engineering Part-II

UTILIZATION OF ELECTRICAL ENERGY& ENERGY CONSERVATION

Teaching Scheme: **Examination Scheme:**
Lectures: 3 Hours /Week   **Paper: 100 Marks**
Tutorial: 1 Hours/Week   **T.W.: 25 Marks**

SECTION-I

1. Load Characteristics:- **(3 Hrs)**
Type of loads, basic equation of motion for drive system, determination of load torque, power requirements and moment of inertia of load, speed – torque curve of load, acceleration time drive, environments of motors, load characteristics for a few typical drives, inertias of load connected to motors

2. Selection Of Motors For Industrial Applications:- **(2 Hrs)**
Motor selection e. g. in textile industries, machine tools, compressor, rolling machines, cement and sugar mills

3. Electric Heating And Welding:- **(5 Hrs)**
Advantages and methods of electric heating, resistance heating, induction heating and dielectric heating, electric arc furnaces
Electric welding, resistance and arc welding, electric welding equipment comparison between a. c. and d. c. welding, modern welding techniques like ultrasonic welding, laser welding

4. Illumination:- **(6 Hrs)**
Introduction, terms used in illumination, laws of illumination, polar curves, photometry, integrating sphere, source of light, discharge lamps, MV and SV lamps, comparison between tungsten filament lamps and fluorescent tubes, basic principles of light control, lighting, street lighting and flood lighting

SECTION-II

5. Electric Traction: **(8 Hrs)**
Traction system, steam engine drive, IC engine drive, electric drive, diesel electric traction, battery drives, mechanics of train movements, speed–time curves for different services, trap zooidal & 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, adhesive weight and breaking retardation, adhesive weight

Coefficient of adhesion, stating of traction motors, calculation methods of reduce energy loss during stating, Types of breaking, advantages and limitations

6. Energy Conservation: (8 Hrs)

Introduction, Motivation for Energy Conservation, Principles of Energy Conservation, Energy Conservation Planning, Energy Conservation in Industries, Electric Energy Conservation in Small Scale Industries, Energy Conservation in Electric Generation, Transmission and Distribution, Energy Conservation in Household and Commercial Sectors, Energy Conservation in Transport, Energy Conservation in Agriculture, Energy Conservation Legislation

Recommended Books:-

1. A course in Electrical Power by J.B. Gupta, S K Kataria And Sons, 1st edition
2. Electrical power by Dr. S.L. Uppal, Khanna Publishers, 13th Edition
3. Generation of Electrical Energy by B.R. Gupta, S Chand, 1st Edition
4. Electrical motors applications & control by M.V. Deshpande
5. Utilizations of electrical energy by E. O. Taylor, Orient Longman Pvt Ltd.
Art & Science of Utilization of Electrical Energy by H Partab

Term-Work:-

There should be minimum 8 tutorials on the above syllabus. Visit to (1) substation and (2) Electric Locomotive. This should be related to syllabus and report based on each visit.