DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY

CIRCULAR NO.ACAD/NP/T.E.[EEE] & [EEP]/Engg./Syll./45/2013

It is hereby informed to all concerned that, on the recommendation of the Dean, Faculty of Engineering and Technology, the Hon'ble Vice-Chancellor has directed that, the "***Syllabus of T.E. [E.E.P.] which was already dispersed*** vide CIRCULAR NO. ACAD / NP/ T.E. [EEP]/ 117 / 2012 dated 01-09-2012 is also applicable to the T.E. [EEE] Branch with retrospective effect from the **Academic Year 2012-2013** and onwards.

All concerned are requested to note the contents of this circular and bring the notice to the students, teachers and staff for their information and necessary action.

University Campus,
Aurangabad-431 004.
REF.NO.ACAD/NP/ENGG./SYLLABUS/
2013/36983-92

Date:- 11-10-2013.

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A.P.Zambare
Director,
Board of College and
University Development.

Copy forwarded with compliments to :-

1] The Principals, affiliated concerned Colleges,
Dr. Babasaheb Ambedkar Marathwada University.

2] The Director, University Network & Information Centre, UNIC, with **a request to upload the above syllabus on University Website [www.bamu.ac.in].**

Copy to :-

1] The Controller of Examinations,
2] The Superintendent, [Engineering Unit],
3] The Programmer [Computer Unit-1] Examinations,
4] The Programmer [Computer Unit-2] Examinations,
5] The Superintendent, [Eligibility Unit] ,
6] The Director, [E-Suvidha Kendra], in-front of Registrar's Quarter,
Dr. Babasaheb Ambedkar Marathwada University,
7] The Record Keeper,
Dr. Babasaheb Ambedkar Marathwada University.

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S/111013/-*

S-19 June & 6 July 2012 AC after Circulars from Cirular No.84 & onwards - 68 -

DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY

CIRCULAR NO. ACAD/NP/ T.E. [EEP]/ 117 / 2012

It is hereby notified for the information of all concerned that, the Academic Council at its meeting held on 06-07-2012 has accepted the ***subject for T.E.[EEP] Part-I, "Digital Electronics & Microprocessor" instead of "Analog & Digital Circuits" as well as the subject of "Microcontroller's" for Part-II in-place of "Microprocessor Interfacing Technique"*** **for the Faculty of Engineering & Technology as appended herewith.**

This is effective from the academic year 2012-2013 and onwards.

All concerned are requested to note the contents of this circular for their information and necessary action.

University Campus,
Aurangabad-431 004.

REF.NO.ACAD/NP/TE [EEP]/
2012/ 29404-30
A.C.S.S.I.No.93
Date:- 01-09-2012.

Director,
Board of College and
University Development.

******

Copy forwarded with compliments to:-

1] The Principals, affiliated concerned Colleges,
Dr. Babasaheb Ambedkar Marathwada University.

Copy to :-

1] The Controller of Examinations,
2] The Superintendent, [Engineering Unit],
3] The Record Keeper,
Dr. Babasaheb Ambedkar Marathwada University.

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S-COVER PAGE WITH PRICE - 444 -

DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD.

REVISED SYLLABUS OF

T.E.

[ELECTRICAL, ELECTRONICS & POWER]

[Effective from -2012-13 & onwards]

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad.

TEACHING & EXAMINATION SCHEME OF REVISED SYLLABUS OF **T.E.(EEP)**Effective from Year 2012-2013

Sr. No.	SUBJECTS	TEACHING SCHEME (Hours/Week)			EXAMINATION SCHEME (Marks)			
	Part - I (First Term)							
		Theory	Practical	Total	Paper	Term Work	Pract&Oral	Total
1	Network Analysis.	4	2	6	100	50	---	150
2	Electrical machine design.	4	2	6	100	---	50	150
3	Digital Electronics & Microprocessor	4	2	6	100	---	50	150
4	Power System Analysis.	4	2	6	100	---	50	150
5	NumericalComputational techniques.	4	2	6	100	50	---	150
	Total of Part – I	20	10	30	500	100	150	750
	Part - II (Second Term)							
7	Electromagnetic Field .	4	---	4	100	---	---	100
8	Power Electronics.	4	2	6	100	---	50	150
9	Control System Engineering	4	2	6	100	---	50	150
10	Microcontrollers	4	2	6	100	---	50	150
11	Energy conservation and Management	4	2	6	100	50	---	150
12	Testing and maintenance of Electrical Equipments.	---	2	2	---	50	---	50
	Total of Part - II	20	10	30	500	100	150	750
	Total of Part – I&II	40	20	60	1000	200	300	1500

TE-01 NETWORK ANALYSIS

TEACHING SCHEME:
THEARY: 4 HRS./WEEK.
PRACTICAL: 2HRS./WEEK.

EXAMINATION SCHEME:
THEORY PAPER: 100 MARKS
TERM-WORK -50 MARKS

Network Topology: **[4 hours]**

Concept of graph, tree and co-tree, cut set matrices and Kirchhoff's laws to network analysis, Choice between loop and nodal analysis, Concept of super loop and super mesh, Dot convention for coupled circuits, concept of duality and dual networks

Solutions of A.C. Network equations and Network theorems: **[10 hours]**

A.C. Circuit Analysis by: Thevenins theorem, Norton's theorem, Superposition theorem. Maximum power transfer theorem, Reciprocity Theorem, Tellengen's Theorem, compensation Theorem. Classical solution of first and second order differential equations for Series and parallel R-L, R-C, R-L-C circuits, Initial and final conditions in Network Elements, Forced and free response, time constants, Physical and mathematical analysis of circuit, internal excitation for second and higher order equations, Network excited by external energy sources, General network solutions in terms of S, Q and ωn.

Network Functions: **[8 hours]**

Terminal pairs, Network Functions for one port and two port, Calculations of network functions for ladder and general network, Poles and zeros, Restrictions on pole and zero locations for driving point and transfer functions, Time domain behavior from pole and zero plot, stability of active network, Relationship of two port variables, Z, Y and transmission parameters, Hybrid parameters, parallel connections of two port networks,

The Laplace Transformation: **[8 hours]**

Definition and properties (basic theory), partial fraction expansion, Heavisides expansion thermo, inverse Laplace transform, Transformed network with initial conditions, Shifted and singularity functions, waveform synthesis, analysis of electrical network with and without initial conditions by Laplace transform for step, impulse and ramp functions, Convolution integral, Laplace transform of various periodic and non-periodic waveforms

Sinusoidal Steady State Analysis: **[8 hours]**

The Sinusoidal Steady state, Sine function oppositely rotating phasor, Steady state response using phasor, Frequency response plot of electrical network, Ports of a network functions, magnitude and phase plot, complex loci, S plane phasor, power transfer and insertion loss of two port network, Effective or RMS values, Average power and complex power, Problems in optimizing power transfer.

Fourier series and Signal Spectra: **[4 hours]**

Fourier series, Evaluations of Fourier Coefficients, Waveform Symmetries as related to Fourier Coefficients, Convergence in Truncated Series, Exponential form of Fourier series, steady state response to Periodic Signals.

TEXT BOOKS:

- M.E.Van Valkenburg , "Network Analysis" Prentice Hall , Third Edition.
- William H. Hayt, Jack E. Kemmerly, "Engineering Circuit Analysis" McGraw Hill International Fifth Edition.

REFERENCE BOOKS:

- "Circuit Analysis",Russell M. Mersereau.,Joel R.Jackson.(P. E.)
- Kelkar Pandit, "Linear Network Theory".
- Kuo F.F , John Wiley "Network Analysis".
- V.K.Aatre,." Network Theory and Filter design", Wiley 1980.

Term Work :

The term work shall consist and following minimum eight experiments and writing computer programs using P-spice or other software and mini project related to the subject.

1) Determination of time-response of R-C circuit to a step d.c. voltage input. (Charging & discharging of a capacitor through a resistor).
2) Determination of time response of R-L circuit to a step d.c. voltage input. (Rise & decay of current in an inductive circuit).
3) Determination of frequency-response of an R-C series circuit.
4) Verification of superposition & Thevenin's theorem.
5) Verification of reciprocity theorem.
6) Determination of step-response of a Second order (R-L-C series circuit) with variable damping.
7) Determination of parameters of a two-port network.
8) Harmonic analysis of no load current of a power transformer.
9) Determination of parameters of coupled circuits.
10) Determination of resonance, bandwidth and Q factor of an R-L-C series circuit.

TE-02 ELECTRICAL MACHINES DESIGN

TEACHING SCHEME:
THEARY: 4 HRS./WEEK.
PRACTICAL: 2HRS./WEEK.

EXAMINATION SCHEME:
THEORY PAPER: 100 MARKS
PRACTICAL & ORAL: 50 MARKS

Introduction : Principles of design, design factors, specifications, standardization, rating, performance & other criterion to be considered, different approaches in computer-aided design. [4 Hrs.]

Magnetic Criterion Calculation : Calculation of ampere turns of magnetic circuit for electrical machines. [4 Hrs.]

Design of transformer : Types, classifications & specifications, design of distribution & power transformer, design of main dimensions, core section, yoke section, clearances, insulation, winding tank-design with & without cooling tubes. [4 Hrs.]

General Concept design of rotating machines : Choice of specific loading, output equation of D.C. & A.C. machines, factors affecting the size of rotating machines, separation of main dimensions. [4 Hrs.]

Design of three phase induction Motors : Stator design, Selection of stator slots, stator winding, stator core, air gap, selection of rotor slots, rotor bars/ winding calculations, design of end ring. [8 Hrs.]

Design of D.C. motor : Selection of number of pales core length, air gap, design of armature of field system. [6 Hrs.]

Design of electrical apparatus & devices: Detail design of D.C. motor & induction motor stator heating coil, regulators field coil, choke coil & lighting magnets. [6 Hrs.]

Term work :

Term work shall consist of five programs in C-language on design of transformer, induction motor, DC motor & starters.

Text book:

1. A course in Electrical machine design by A.K. Sawhney
2. Principles of Electrical machine design by mittle & mittle.
3. Principles of Electrical machine design by R.K. Agarwal

Reference books:

1. Performance & design of A.C. Machine by M.G. Say.
2. Performance & design of D.C. machine Clayton
3. Principles of Electrical Machine Design with Computer programming by S.K. Sen.

DIGITAL ELECTRONICS AND MICROPROCESSORS

Teaching Scheme
Lecture: 4 Hrs/week
Practical: 2 Hrs. / Week

Exam Scheme
Paper: 100 Marks
Practical:--
Term work: 50 Marks

Topics and Contents **Hours**

1 .Fundamentals of Digital Electronics: **02**

Review of number systems - binary, octal and hexadecimal number systems, their conversions and arithmetic, 1's and 2's complements; weighed and non-weighted codes, BCD codes, excess-3 code, Gray code, error correcting and detecting codes; Review of logic gates and logic families

2. Combinational Logic Circuits: **06**

Introduction to Karnaugh map, min terms and max terms representation of logical functions, sum of product and product of sum form minimization, redundant terms, Quine- Mcklusky method for minimization, design of combinational logic circuits, design of half adder and subtractor, design of full adder and subtractor, binary parallel adder & subtractor,

3. Sequential Logic Circuits: **06**

Flip-Flops: R-S, D, J-K, T, Master slave flip-flops, their conversion, different flip-flop ICs. Counters: Different types of counters, design of divide by N asynchronous and synchronous counters, design of BCD, decade, up-down counter, ring and shift counters, different counter ICs. Shift Registers: data-in and data-out modes, SISO, SIPO, PISO and PIPO modes, left shift and right shift register; Universal shift register, IC 7495. Multiplexer,

4 .D/A and A/D Converters: 06

Digital to analog converter (DAC)-weighted register method, R-2R ladder method, analog to digital converter (ADC)- parallel comparator method, counter method, successive approximation method, counting A/D converter, dual Slope A/D converter, A/D converter using voltage to frequency and voltage to time conversion.

5. Introduction to 8 bit microprocessor and Programming: 10

Basic block diagram of microprocessor, Internal architecture of Intel 8085, Block diagram, registers, Internal bus organization, pin description, control signals, Interrupt structure.
Instruction set, classification of instruction, Addressing modes , concept of looping, Indexing and Flowcharting. Timing diagrams of 8085.Programs based on data transfer, Arithmetic and logical operation, code conversion, Block transfer, Stack and subroutines. Delay subroutines (with a register and register pair)

6. Peripherals and Interfacing: 10

8255 Programmable Peripheral Interface,8253 Programmable Interval Timer,8257 DMA Controller,8259 Programmable Interrupt Controller,8279 Programmable Keyboard Display Controller,8251 LED, Seven segment display, Relay, Keyboard, Stepper Motor, ADC and DAC, Memory Interfacing

Text/Reference Books:

Digital Electronics

1. R. P. Jain, "Modern Digital Electronics", Tata McGraw Hill Publications.
2. Malvino and Leach, "Digital Principles and Applications", McGraw Hill Publications.
3. Gothman, "Digital Electronics", Prentice Hall Publications.
4.Anand Kumar, "Fundamentals of Digital Circuits", Prentice-Hall India.

Microprocessors

1 Microprocessor Programming And Applications by Gaonkar. Willey Eastern Publications.
2 Microprocessor and programmed logic – K.C. Short,2nd Edition, Pearson Education.
3 Fundamentals of Microprocessor and Microcomputers- B.Ram. TMH
4 Microprocessor and Digital System-Douglas Hall.TMH
5 Microprocessor Hardware Interfacing and Application .Bray CBS.
6 Microprocessors and Peripherals B.Venkatramani,TMH
7 Microprocessor and Interfacing Programming and Hardware .Douglas V Hall.

Practical Exam:

.....The practical exam will be of three hours duration. It will consist of one experiment conducted during the course and oral exam based on the syllabus.

Any 8 Experiments from the list given below:

List of experiment:

1&2. Design and implementation of any two combinational logic circuits based on examples such as to find majority of one's, to find numbers exactly divisible by 3 or 4 etc.
3. To design arithmetic circuits such as half and full adder, half and full subtractor.
4. Study of multiplexer and demultiplexer and function realization using data selector IC's
5. Study of A/D converters (any one type)
6. Study of D/A converters (any one type)
7 Arithmetic operations on two 8 bit numbers
8 Addition and Subtraction of two 16 bit numbers
9 Operation on two 16 bit BCD NUMBERS (Using DAA Instruction)
10 Block Transfer of Data bytes.
11 Program controlled data transfer using 8255 PPI
12 Interfacing 7 segment LED display using 8055A in static and dynamic mode.
13 Interfacing keyboard using 8279.
14 Interfacing display using 8279.
15 Interfacing ADC 0808/0809.
16.Interfacing DAC 0808

TE-04 POWER SYSTEM ANALYSIS

TEACHING SCHEME:
THEARY: 4 HRS./WEEK.
PRACTICAL: 2HRS./WEEK.

EXAMINATION SCHEME:
THEORY PAPER: 100 MARKS
PRACTICAL & ORAL: 50 MARKS

Representation of Power System Components : Power in single-phase a. c. circuit Complex power, complex power balance, power factor correction, complex power flow, balanced and reactance diagrams of a power system, per unit system per unit representation of transformers, synchronous machines, representation of loads. (06 Hours)

Network Equations : Graph theory and its applications for formation of primitive network and Z and Y matrices, incidence matrices, Y-bus and Z-bus matrices. (06Hours)

Load Flow studies : introduction, network model formulation, formation of Y-bus by singular transformation, Load flow problem, Iterative methods of load flow such as Gauss Gauss-Seidel, Newton-Raphson method, decoupled load flow and fast decoupled load flow. (10 Hours)

Symmetrical Fault Analysis : Transients on a transmission line, short circuit of a synchronous machine on no load and on load. Short circuit current computation, selection of circuit breakers, Z-bus formulation, algorithm of short circuit studies (6 Hours)

Symmetrical Components and Unsymmetrical Fault Analysis : Fundamentals of symmetrical components, sequence impedance and sequence network of star connected loads, transmission lines, synchronous machines, and transformer, sequence network of a loaded generator, single line to ground (L-G), Line to line (L-L), double line to ground (L-L-G) faults, unbalanced fault analysis of above faults using bus impedance matrix, bus voltages and line currents during faults. (12Hours)

Text Books:

Stevenson W. D. " Elements of Power System Analysis", McGraw-Hill
I. J. Nigrath & D. P. Kothari , " Modern System Analysis", Tata McGraw-Hill

Reference Books :

"Power system analysis" T.K.Nagsarkar, M.S. Sukhiya.(OXFERD U. P.)
Stevenson W. D. and Grainger J. J. "Power System Analysis", McGraw-Hill
Wadhawa C.L. " " Elements Power System ",John Wiley & Sons,
Stagg W. D. & El-Abiad A. H. ," Computer Method in Power System Analysis", McGraw-Hill
H. Saadat, " Power System Analysis", McGraw-Hill

Elgerd O. I. "Electrical Energy System Theory ", McGraw-Hill.
"Power system analysis"

Term Work :

The term work shall consist of either writing computer programs or solving following power system problems using MATLAB or other software and a mini project related to the subject.

1 Solution of Building the bus admittance matrix for given power system network.
2 Solution of power flow problem for given power system network using Gauss-Seidel method
3 Solution of power flow problem for given power system network using Newton-Raphson method.
4 Solution of power flow for given power system network using Fast-Decoupled method.
5 Solution of formation of bus impedance matrix by building algorithm method.
6 Solution of computing the fault current, bus voltage, and line currents for a bolted

TE-05 NUMERICAL COMPUTATIONAL TECHNIQUES

TEACHING SCHEME:
THEARY: 4 HRS./WEEK.
PRACTICAL: 2HRS./WEEK.

EXAMINATION SCHEME:
THEORY PAPER: 100 MARKS
TERM WORK: 50 MARKS

Introduction: **[4hours]**

Role of mathematical modeling in engineering problem solving, Approximation and Round – off errors, Accuracy and Precision errors, Truncation errors and the Taylor series, Introduction to MATLAB.

Roots of equations: **[8 hours]**

Roots of algebraic and transcendental equations: Bracketing methods- bisection method, false position, Open methods – Newton Raphson, Secant method. Real and complex roots of polynomials: Bairstow's method, Application: design of an electrical circuit.

Linear Simultaneous algebraic equations: **[10 hours]**

Cramer's rule, Gauss elimination – pitfalls and remedies, Gauss-Seidal, Gauss-Jordan method, Newton Raphson method.Introduction to Eigen value and Eigen vectors and iterative method to estimate them Application: solving resistive networks.

Curve fitting: **[6 hours]**

Interpolation –Newton's polynomial, Lagrange polynomial. Applications to find the characteristics of electrical machines.

Numerical Integration and Differentiation: **[6 hours]**

Integration: Newton-Cotes formulae – Trapezoidal rule, Simpson's Rule. Differentiation: High Accuracy formulae, Application: calculation of RMS current.

Ordinary Differential equations: **[6 hours]**

Euler's method, Modified Euler's method, Runge–kutta method. Application to calculate transients in electrical circuits.

TERM WORK:

It shall comprise of 12 programs in C or MATLAB for solving problems demonstrating use of various numerical methods learned.

TEXT BOOKS:

- Steven Chapra, Raymond P. Canale, " Numerical Methods for Engineers"
- Santosh K. Gupta, "Numerical Methods for Engineers" Wiley Eastern.
- S.S.Sastry "Numerical Methods".
- Rudra Pratap, "MATLAB Programming", Tata McGraw Hill

TE-06 ELECTROMAGNETIC FIELDS

TEACHING SCHEME:

THEARY: 4 HRS./WEEK.

EXAMINATION SCHEME:

THEORY PAPER: 100 MARKS

Vector analysis: **[7hours]**

Scalars and vectors, Vector algebra, Vector components and unit vectors, Vector field, The Cartesian Co-ordinate System, Dot, cross products, circular, cylindrical and spherical coordinate systems. Coulomb's Law and electric field intensity, Electric field due to a continuous Volume Charge Distribution, field of a line charge, field of a Sheet of a charge, streamlines and sketches of fields.

Electric Flux Density Gauss Law and divergence: **[7 hours]**

Gauss's Law and its Applications: to some symmetrical charge distribution and differential volume element, divergence, Maxwell's first equation (electrostatics), the vector operator and the Divergence theorem, Energy and Potential Energy expended in moving a point charge in an electric field, line integral, potential difference and potential, potential gradient, potential field of a point charge and system of charges, dipole, energy density in electrostatic field.

Conductors, dielectric and capacitance: **[7 hours]**

Current and current density, continuity of current, metallic conductors, conductor properties and boundary conditions and method of images, semiconductors, nature of dielectric, boundary conditions for perfect dielectric, capacitance, and capacitance of two-wire line. Poisson's and Laplace Equations: Uniqueness theorem, examples in rectangular, spherical and cylindrical coordinates, product solutions of Laplace equations, and solutions of Poisson's equations

Steady Magnetic Field: **[7 hours]**

Biot-Savart's law, Amperes circuital law, curls, strokes theorem, magnetic flux and magnetic flux density, scalar and vector magnetic potentials.

Magnetic forces and inductance: **[7 hours]**

Force on moving charge, differential current element, force between differential current element and torque on a closed circuit, nature of magnetic materials, magnetization permeability, magnetic boundary conditions, magnetic circuit, potential energy and forces on magnetic materials, self and mutual ind

Time varying fields and Maxwell's equations: **[5 hours]**

Faradays law, Maxwell's equations in point form, Maxwell's equations in integral form, retarded potentials.

TEXT BOOKS:

- William H.Hayt. "Engineering Eletromagnetics" Tata Mc Graw-hill Fifth edition.

- Edminister Schawn's "Outline Theory and Problems of Electromagnetics" Tata McGraw-hill edition.

REFERENCE BOOKS:

- "Elements of electromagnetics" Matthew n. o.Sadiku.
- Singh, "Electromagnetic Waves and Fields" Tata McGraw-hill edition.
- P.C.Krause, "Electromagnetic Fields", McGraw Hill Publication..

TE-07 POWER ELECTRONICS

TEACHING SCHEME:
THEARY: 4 HRS./WEEK.
PRACTICAL: 2HRS./WEEK.

EXAMINATION SCHEME:
THEORY PAPER: 100 MARKS
PRACTICAL & ORAL: 50 MARKS

Thyristor family Devices **[4 hours]**

Structure, Characteristics, Switching actions, Trigger requirements, Ratings, Protections and Areas of application of SCR, TRIAC and GTOs.

Transistor family Devices **[4 hours]**

Structure, Characteristics, Switching actions, Trigger requirements, Protections and Areas of application of IGBT, Power MOSFET and MCTs, Introduction to PICs.

AC-DC Converters **[10 hours]**

Single phase and three phase half (semi) and full converters: Quadrants of operation, circuit configurations, working, performance parameters and input-output waveforms for R, R-L and RLE loads. Dual converter in circulating and non-circulating current modes.

DC-DC Converters **[6 hours]**

Step-up and step-down configurations, CLC and TRC techniques, PWM and FM techniques. Practical transistorized chopper circuits: working, control, output waveforms, continuous and discontinuous current conduction.

DC-AC Converters **[10 hours]**

Single phase and three-phase thyristorised bridge circuits, output waveforms for R and R-L loads. PWM techniques-Single, Multiple and Sinusoidal PWM.

PWM Inverters: Principle of operation, Performance parameters, Working of single phase and three phase circuits, Current Source Inverter, ASCCSI.

PWM Converters **[6 hours]**

Principle of operation, circuit configurations, performance waveforms and applications of Switched Mode Converters (buck, boost and buck-boost) Switched Mode Rectifiers, Power conditioners and UPS.

Text Books

1. Power Electronics by M.H. Rashid, , 2nd Ed, PHI Pub. 1994.
2. Power Electronics by Mohan, Undeland, Robbins, , 2nd Ed, John Willey & Sons, 1995
3. Power Electronics by B.W.Williams, John Willey,1975.

Reference Books:

"Elements of power electronics" By. Philip T. Krein.
"Power Electronics" by V. R. MOORTHI.
Power Semiconductor Circuits by S.B.Dewan and Straughan, John Willey
Power Electronics and AC Drives' by B.K.Bose, Pearson
SPICE for Power Electronics by M.H.Rashid, McGraw Hill International.

The laboratory consists of minimum EIGHT experiments from following list.
any THREE from 1 to 4 THREE from 5 to 8 and TWO from 9 to 11.

1. SCR Turn-on methods.
2. SCR Commutation methods.
3. IGBT / MOSFET Drivers.

4. TRIAC –Phase control.
5. Single phase /three phase Converter
6. D.C.Chopper
7. Single phase / three phase Thyristorised Inverter
8. PWM Inverter
9. Simulation of Converter / Chopper
10. Simulation of PWM Inverter
11. Switched mode Converter / Rectifier

TE-08 CONTROL SYSTEMS ENGINEERING

TEACHING SCHEME:
THEARY: 4 HRS./WEEK.
PRACTICAL: 2HRS./WEEK.

EXAMINATION SCHEME:
THEORY PAPER: 100 MARKS
PRACTICAL & ORAL: 50 MARKS

Modeling and representation of control system and Components: [6 hours]

Open and closed -loop systems. Tracking regulator and process control systems, Linear Mathematical models, Electrical analogy, Transfer function, Block diagram, Signal flow graph , Servo components: Error detectors, Potentiometer, synchros, and gyros, optical rotary encoders, DC and AC Servomotors, stepper motor, gear trains, A C and DC tacho-generators, Preamplifiers, Modulator and demodulators Transfer function and applications of these in control systems

Time Domain Analysis [4 hours]

Transient response of second order system, Time domain specification, Steady state error and static error constants, Dynamic error coefficients, Performance indices and their use in system optimization, Concept of system sensitivity to disturbance signals.

Stability concepts [8 hours]

Nature of system response from the location of roots in the s- plane of characteristic equation, Absolute and relative stability, Routh stability criterion and its application in special cases. Nyquist stability criterion and stability margin. Polar plots, Constant- M circle, Nichols chart, sensitivity analysis in frequency domain, Stability Margin from the Sensitivity function.

Root locus [10 hours]

Definition of root locus, Rules for plotting root loci, Root contour, stability analysis using root locus. Effect of addition of poles and zeros, Compensator design using root locus. Lead, Lag, Lag-Lead compensator, Root locus with dead time, Sensitivity and root locus, Concept of PID controller, Functions of PID controller, Analog and Digital PID controller

Frequency domain analysis [10 hours]

Frequency domain specification, Correlation between time and Frequency domain responses, Bode plot, Determination of gain and phase margin from Bode plot, Effect of gain variation and addition poles and zeros on Bode plot Determination of transfer function from Bode plot, Compensator design using Bode plot, Lead, Lag, Lag-Lead compensator.

State space concept **[4 hours]**

Concept of state and state variable, state equations of linear time- invariant and continuous data system. Matrix representation of state equation,

Text Books:

- 'Modern Control Engineering' by Katsuhiko Ogata , Prentice Hall of India Pvt Ltd.
- 'Control system Engineering' by I J Nagrath and M. Gopal , Wiley Eastern Ltd,3rd edition, 2000.
- 'Automatic Control system' by Benjamin C. Kuo, Prentice Hall of India Pvt Ltd.
- 'Control systems-Principles and design' by M.Gopal, 2nd edition,2002.
- 'Control system Engineering' by Norman Nise,2nd edition,1995.
- 'Modern Control System' by Richard C Dorf, Robert H Bishop, Eighth Edition, Addison Wesley 1998.

Reference Books;

- "Controll system"by Smarajit Ghosh.
- 'Linear control system analysis and design (conventional and modern)' by John J. D'Azzo , C. H. Houpis, McGraw Hill International Fourth edition.
- 'Design of feedback Control Systems' by Stefani, Savant, Shahin, Hostetter, Saunders College Publishing International, Fourth Edition.

Term work :

The term work shall consist of a record of minimum EIGHT experiments from the following list and a mini project related to subject.

1) Use of potentiometers as error detectors.
2) Use of synchros as error detectors.
3) Study and plotting of characteristics of rotary optical encoder.
4) Study and plotting of characteristics of linear and PWM servo-amplifiers.
5) Determination of transfer function of :
   i) Armature-controller D.C. servo motor.
   ii) A.C. servo motor.
6) Time domain analysis of a second order system.
7) Computer aided plotting of root-locus.
8) Computer aided plotting of Nyquist and Bode-plots.
9) Study of a continuous – time and / or digital position control system.
10) Study of Regulator system.
11) Study of a process control system and use of a PID controller.
12) Computer aided design of a liner control system.

MICROCONTROLLERS

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

Exam Scheme:
Paper: 100 Marks
Practical Exam: 50 Marks
Term Work: ---

Topics and Contents	Hours
1. Architecture Introduction, evolution, Architecture, comparison with microprocessor, commercial microcontroller devices, Applications, selection of a microcontroller,MCs51 architecture,8051 pin description, connections, I/0 port and memory organization	12
2. Programming: Addressing mode, instruction, on chip peripherals-I/O port programming, Interrupts, Timers/counter and serial communication,	10
3. Interfacing Real word interfacing such as LED, LCD, ADC, DAC, stepper motor ,key board, relays octo isolators ,external memory and PPI 8255 Interface.	10
4. Applications: Case study such as motor control, temperature controller	8

Practical Exam:

The practical exam will be of three hours duration. It will consist of one experiment conducted during the course and oral exam based on the syllabus.

List of Experiments:

Software based experiments:

1. Addition and Subtraction of two 16 bit numbers.
2. Operation on two 16 bit BCD numbers.(using DAA instruction)
3. Block transfer of data bytes.
4. Searching of the smallest and largest element in a block of data.
5. Sorting the elements of a block of data in ascending and descending order.
6. Multiplication and division of 8 bit numbers

Hardware based Experiments:

1. Interfacing of ADC.
2. Interfacing of LCD.
3. Interfacing of LEDs.
4. Interfacing of stepper motor.

BOOKS:

1.Ajay Deshmukh- MicrocontrollerTMH

2.M.A.Mazdi&J.G.Maizdi –The 8051 Microcontroller and Embeded system 3rd Indian reprint pearson Edùcation.

3.Kenneth J Ayala – 8051 Microcontroller 2nd edition, Program Interfacing

4.Embeded Microcontroller –Intel manual

TE-10 ENERGY CONSERVATON AND MANAGEMENT

TEACHING SCHEME:
THEARY: 4 HRS./WEEK.
PRACTICAL: 2HRS./WEEK.

EXAMINATION SCHEME:
THEORY PAPER: 100 MARKS
TERM-WORK -50 MARKS

Energy conservation management ***(12 hours)***

The relevance of energy management profession; general principles of energy management and energy management planning; application of Pareto's model for energy management; obtaining management support; establishing energy data base; conducting energy audit; identifying, evaluating and implementing feasible energy conservation opportunities; energy audit report; monitoring, evaluating and following up energy saving measures/ projects.

Energy efficiency ***(16 hours)***

Energy efficiency analysis; thermodynamics and energy; coefficient of performance; energy effectiveness; management of heating, ventilating and air-conditioning (HVAC) – principles, opportunities, case studies; management of process energy- principles, opportunities, case studies; management of electrical load and lighting - management opportunities with electric drives, lighting, heating and electrolytic systems; electrical load analysis; peak demand control; computer-aided energy management; cogeneration; forms of cogeneration; feasibility study for cogeneration.

Energy efficiency of turbines, compressors and pumps (brief treatment only); specific energy consumption; parameters affecting specific energy consumption; flexi targeting technique.

Energy economics ***(12 hours)***

Financial evaluation of energy projects; cash flow model; time value of money; evaluation of proposals - payback method, average rate of return method, internal rate of return method, present value method, profitability index, life cycle costing approach, investment decision and uncertainty; consideration of income taxes, depreciation and inflation in investment analysis.

Text-books:

1. '*Industrial energy conservation*'
   – Charles M Gottschalk, John Wiley & Sons, 1996
2. '*Energy management principles*'
   – Craig B Smith, Pergamon Press

– *References:*

1. IEEE recommended practice for energy management in industrial and commercial facilities, IEEE std 739 – 1995 (Bronze book)

2. '***Optimizing energy efficiencies in industry***'
   – G G Rajan, Tata McGraw Hill, Pub. Co., 2001
3. '***Energy management***'
   – Paul O'Callaghan, McGraw Hill Book Co
4. '***Energy management Hand Book***'
   – Wayne C Turner, The Fairmount Press, Inc., 1997
5. '***Energy Technology***'S Rao and B B Parulekar, Khanna Publishers, 1999

TE- 11 TESTING AND MAINTENANCE OF ELECTRICAL EQUIPMENTS

TEACHING SCHEME:
PRACTICAL: 2HRS./WEEK.

EXAMINATION SCHEME:
TERM WORK: 50 MARKS

Testing of Underground Cables: Types of cables, insulation in cables, armoring and coring of cable, insulation resistance test of cable, stress in insulation and capacitance, sheathing in cables, measurement of capacitance in three core cables, thermal characteristic, breakdown of cables, operating problems with cables.

Maintenance of Electrical Equipments : Routine, preventive and breakdown maintenance, main causes of failure of electrical equipments, factors maintenance schedule, maintenance schedule for distribution transformer as per I.S. 1886, maintenance schedule for power transformer as per I.S. 11028, maintenance schedule for induction motor as per I.S. 900, maintenance schedule for synchronous motor as per I.S. 4884, maintenance schedule for storage battery, maintenance schedule for switch gear and control equipment as per I.S. 3072.

Testing of Insulation : Insulation resistance measurement, drying of electrical insulation, test on transformer oil as per I.S. 1692, acidity test, sludge test, flash point test, crackle test, testing of underground cables as per I.S. 7404, testing of electrical installation as per I.S. 732.

Earthling : Methods of earthling, plate and pipe, grid-earthing, value of earth resistance, code of practice for earthing as I.S.3043

Text Books:

" The Transmission and Distribution of Electrical Enetgy" H. Cotton, The English Language Book Society.

"The Principales of Electrical Power Transmission" H. Waddicor, Asia Publishing House, Mumbai

" A Text Book on Power System Engineering" A. Chalrabarati, M. L. Soni, P. V. Gupta, U.S. Bhatanagar, Dhanpat Rai and company

Reference Books :

" Transmission and Distribution" J.B.Gupta, S. K. Kataria & Sons New Delhi.

" Electrical wiring Estimation & costing " S.L.Uppal, Khanna publishers, New Delhi.

" Electrical power" S.L.Uppal, Khanna publishers, New Delhi.

" Art and science of electrical utilization " H. Partab, , Dhanpat Rai and sons New Delhi.

" Electrical wiring Estimation & costing " B. D. Arora, New Heights, New Delhi.

" Practical relay circuits " Frank J. Oliver, D. B. Taraporewala sons Mumbai

"Electrical estimating & costing " N. Alagappan S. Ekambaram, Tata Mc Graw-Hill publishing company limited New Delhi. Relevant I.S. Codes.

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