SOLAPUR UNIVERSITY, SOLAPUR.

FACULTY OF ENGINEERING & TECHNOLOGY

STRUCTURE OF T.E ELECTRICAL AND ELECTRONICS ENGINEERING

W.E.F. 2014-15

Semester- 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	Instrumentation Techniques	4	2	--	100	25	----	25	150
3	Micro Processor & its applications	4	2	--	100	25	50	--	175
4	Elements of power system	4	--	1	100	25	--	--	125
5	Control system-I	4	2	--	100	25	50	--	175
6	Computer Lab	----	2	--	--	50	--	--	50
7	Self Learning (HSS)				50				50
	Total	20	08	02	550	175	100	25	850

Semester- 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	--	--	100	25	--	--	125
3	Power system analysis	4	2	--	100	25	--	25	150
4	Control system-II	4	2	--	100	25	--	--	125
5	Microcontroller & Its Applications	4	2	--	100	25	50	--	175
6	Mini hardware Project	--	2	--	--	50	--	--	50
7	Self Learning (Technical)				50				50
	Total	20	10	--	500	225	100	25	850

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.
3) Mini hardware Project group shall not be of more than three students.
4) Appropriate Elective I & II Subjects may be added when required.

5) Student shall select one Self Learning Module at T.E. Part I and T.E. Part II each from Technical and Humanities and Social Sciences Group with at least one Self Learning Module from the Humanities and Social Sciences Group
6) Curriculum for Humanities and Social Sciences Self Learning Modules is common for all under graduate programmes of faculty of Engineering and Technology
7) Project group for B.E.(Electronics) Part I and Part II shall not be of more than four students.
8) Term work assessment shall be a continuous process based on student's performance in – class tests, assignments, homework, subject seminars, quizzes, laboratory books and their interaction and attendance for theory and lab sessions as applicable.
9) Department shall appoint the subject coordinator for self learning subject at semester I and semester II and the students should submit minimum four assignments to the subject coordinator for evaluation.

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

1. ELECTROMAGNETIC ENGINEERING

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

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

Course Objectives:

1. To make the students evaluate Scalar and Vector Calculations and Electrostatic fields.
2. To make the students understand the concept of Gauss law, its applications, Capacitance configurations and Boundary conditions in electrostatic fields.
3. To make the student learn the concept of Steady magnetic fields, Biot-Savart law and Ampere circuital law.
4. To make the students well conversant about the concept of Electromagnetic Induction, Waves, Magnetic Force and Time varying fields.

Course Outcomes:

1. The students will be able to evaluate basic scalar & vector quantities, Gauss Law, Vectors and Potential.
2. The students will be able to explain Steady magnetic fields, Biot-Savart law and Ampere circuital law and solve numerical on them.
3. The students will be able to explain Electrostatic fields and Time Varying fields.

SECTION I

Unit-1: Electrostatics (8Hrs)

Scalars & vectors, vector algebra, vector components & vectors, vector field, Dot & cross products, The Cartesian, cylindrical & spherical coordinate systems, Conversion from one system to other, Coulomb's law & Electric field intensity, Electric field due to continuous line charge, sheet of charge & voltage charge distribution ,Streamlines & sketches of fields.

Unit-2: Electric Flux density-Gauss law & Potential (9Hrs)

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, Differential relation between E & V, dipole, energy density in electrostatic field.

Unit 3: Conductors, Capacitance Laplace & Poisson's Equation (7Hrs)
Current & current density, Continuity of current, Conductor properties & boundary conditions, nature of dielectric, boundary conditions for perfect dielectric, capacitance & various capacitor configurations, Poisson's & Laplace equations. Uniqueness Theorem

SECTION-II

Unit 4: Steady Magnetic Fields (8Hrs)
Biot-Savart law, Ampere circuital law, point & differential form, Curl Stroke's theorem, Magnetic field & Magnetic flux density, scalar & vector magnetic potentials

Unit 5: Magnetic Forces & Inductance (7Hrs)
Force on a moving charge, force between differential current element & torque on a closed circuit, nature of magnetic materials, magnetic boundary conditions, concept of self & mutual induction

Unit 6: Time Varying Fields (9Hrs)
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, and Plane electromagnetic waves in space in pure & lossy dielectric media.

Text Books:
1. Electromagnetic Engineering by W. Hayt, McGraw Hill, 7th Ed
2. Field wave Electromagnetic by David Cheng, Pearson Education

Reference Books :
1. Schaum's series in Electromagnetic- Edminister, McGraw Hill, 2nd Ed
2. Electromagnetism -A. Pramanik, PHI
3. Electromagnetics with Applications- Kraus Heisch, McGraw Hill, 5th Ed

Term-work
Term-work shall consist of minimum eight tutorials/ assignments based on the above syllabus.

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

2. INSTRUMENTATION TECHNIQUES

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

Examination Scheme:
Theory : 100 Marks
TW : 25 Marks
OE **:** 25 Marks

Course Objectives:
1. The make the students understand the different types transducers and their applications.
2. To make the students understand basic principle and working of instrumentation amplifier and Isolation & programmable gain amplifier, active filters.
3. To make the student well conversant about the different data conversion technique and data transmission system.
4. To give the students brief introduction of PLC, different I/O Devices & Displays .

Course Outcomes:
1. The students will be able to explain different applications of Transducer.
2. The students will be able to measure different parameters using Transducer.
3. The students will get knowledge regarding PLC, different I/O Devices & Displays.

SECTION-I

Unit1: Introduction **(6Hrs)**

Instrumentation system block diagram and function of each block, Brief idea of static characteristics of measuring devices accuracy, precision, errors, uncertainties, linearity, resolution

Unit 2: Signal Conditioning: **(8Hrs)**

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.

Unit 3: Data conversion and acquisition: **(8Hrs)**

Principles and working of different types of ADC and DAC, Data acquisition systems, Sample and hold circuit, frequency to voltage, voltage to frequency and current to voltage converter, Interfacing transducers to electronic control & measuring System.

SECTION-II

Unit 4: Data Transmission: (4Hrs)
General telemetry system, landline, voltage, Current, Position telemetering system, Radio Frequency telemetry, different codes of telemetry system.

Unit 5: I/O Devices, Displays and digital Instruments: (7Hrs)
Analog display, oscillographic recorder, strip chart, Tape recorders, Oscilloscope, various parts, , Digital input and output devices, 7 segment display

Unit 6: Programmable Logic Controller: (7Hrs)
Introduction to PLC hardware, Architecture of PLC, CPU memory i/p and o/p, explanation of ladder diagram Logic, types of PLC system, Programming devices of PLC, Role of PLC in automation.

Unit 7: Signal Generator & Analyzers: (5 hrs)
Function generator, pulse generator, Harmonic distortion analyzer, spectrum analyzer.

Text Books:
1. Electronic Instrumentation- by H.S. Kalsi, Tata McGraw Hill, 2nd edition
2. Electrical & Electronics Measurement – by A.K. Sawhney, DhanpatRai& Co (P) Ltd, 8th edition
3. Instrumentation Devices & Systems – by Rangan, Mani, Sharma, Tata McGraw Hill, 2nd edition

Reference Books:

1. Industrial Instrumentation and Control, S.K.Singh.
2. Instrumentation: Measurement and Analysis, Sixth Reprint by Nakra & Chaudhari, Tata McGraw Hill, New Delhi.

Term work:-
Term Work: Minimum 8 Experiments based on above syllabus. The following list is given for reference.

List of Experiments:-

1. Measurement of temperature using of RTD.
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. Measurement of speed by optical transducer.
7. Study of IC tester.
8. Use of Potentiometer as a transducer
9. Frequency response of active low-pass filter.
10. Frequency response of active high-pass filter.
11. Frequency response of active band-pass filter.
12. Measurement of water flow.

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

3. MICROPROCESSOR AND ITS APPLICATION

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

Examination Scheme:
Theory : 100 Marks
TW : 25 Marks
POE : 50 Marks

Course Objectives:

1. To make the students understand Architecture and Instruction Set of microprocessor 8085.
2. To make the students utilize instruction set of 8085 to write assembly language programming.
3. To make the students perform Interfacing and understand assembly language programs for interfacing of chips 8255, 8254,8259 with 8085.

Course Outcomes:

1. The students will be able to explain Architecture and Instruction Set of microprocessor 8085.
2. The students will be able to do assembly language programming and interfacing of 8085 with chips 8255, 8254,8259 with 8085 .
3. The students will be able to perform Interfacing of ADC 0808/0809, DAC 0808 with 8085.
4. The students will be able to explain different applications of Microprocessor.

SECTION-I

Unit 1: Architecture of Intel 8085 microprocessor: (10Hrs)
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

Unit 2: Programming & Timing diagrams: (7Hrs)
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.

Unit 3: Memory & I/O interface: **(7Hrs)**

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

Unit 4:Peripheral chips: **(7Hrs)**

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

Unit 5:Data Converters and Interfacing: **(6Hrs)**

DAC weighted resistor and resistor ladder DAC, Dual slope ADC, ADC-Successive approximation, Interfacing ADC 0808/0809, DAC 0808 with 8085.

Unit 6: Serial I/O & Data Communication: **(5Hrs)**

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.

Unit 7: Applications of 8085: **(6Hrs)**

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

Text Books:

1. Vibhute & Borole "8 bit Microprocessor" Tech Max publications
2. Micro processor and micro controller by B. Ram, Dhanpat Rai & co. publication 5th edition.

Reference 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

Term work: Minimum 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.

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

4. ELEMENTS OF POWER SYSTEM

Teaching Scheme:
Lectures: 04 Hours/Week
Tutorial: 01 Hours/Week

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

Course Objectives:

1. To make the students understand basic theory of transmission lines.
2. To make students analyze the performance and mechanical design of transmission lines.
3. To make the students aware of the basic construction and working of Cables and insulators.

Course Outcomes:

1. Students can explain main components of transmission line.
2. Students will be able to explain Characteristics and evaluate performance of Transmission Lines.
3. The students can draw and explain Construction and working of Cables and Insulators.

SECTION - I

Unit 1: Mechanical Design of Overhead Lines: (7Hrs)

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

Unit 2: Overhead Transmission Line parameters: (9Hrs)

Types of conductors, bundled conductor, Constants of transmission line, Resistance of a transmission line ,Skin Effect, Calculation of inductance for single phase and three phase, symmetrical and asymmetrical conductor configuration with and without transposition, Concept of Self –GMD and Mutual GMD, capacitance calculations for symmetrical and asymmetrical single and three phase, single and double circuit lines, Skin and Proximity effects.

Unit 3: Overhead Line Insulators & Corona: (8Hrs)

Types of Insulators, string efficiency ,Methods of improving String efficiency, Arcing horn, grading ring of insulators, Numerical problems-voltage distribution, 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

SECTION – II

Unit 4: Characteristics and Performance of Transmission Line: (10Hrs)
Classification of Overhead transmission lines, Short, medium and long lines and their model representation, estimate regulation and efficiency of all types of lines , End condenser method, Nominal T-method, Nominal π-method. Voltages and currents at sending and receiving end of line, Analysis of long transmission line(Rigorous method), Generalized Circuit constants of a transmission line ABCD, Determination of generalized constants for transmission line.

Unit 5: Underground Cables: (9Hrs)
General construction of cables, Requirements of cables, Cable conductors, insulating materials for cables, classification of cables, Insulation resistance of 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, Selection of cables

Unit 6: Power Factor Improvement: (3Hrs)
Power factor, Causes of low power factor, Methods of p.f. improvements, Economics of p.f. improvements

Text 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. Electrical Power System by Ashfaq Husain, CBS, 5th Edition
4.Electrical Power transmission and distribution ,U.A Bakshi, M.V.Bakshi Technical publication ,Pune

Reference Book:
1. Power System Engineering by M L Soni, P V Gupta, U S Bhatnagar, A Chakrabarti, Dhanpat Rai & Co
2. Electrical Power by Dr. S.L. Uppal, Khanna Publishers, 13th Edition
3. Elements of Power Systems Analysis- William D. Stevenson. Jr., MCGraw Hill, 4th Edition

Term Work:
Term work should consist of minimum eight assignments/drawing sheets based above theory.

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T.E. Electrical & Electronics Engineering Part-II

5. CONTROL SYSTEM-I

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

Examination Scheme:
Theory : 100 Marks
TW : 25 Marks
POE : 50 Marks

Course Objectives:
1. To make the students design mathematical models of physical systems.
2. To make the students understand the Feedback Control System and their characteristics.
3. To make the students evaluate stability of the system in Time Domain and Frequency Domain.
4. To make the students learn different compensators and controllers.

Course Outcomes:
1. Students will be able to evaluate deriving transfer function of control system.
2. Students will be able to draw Mathematical models of physical system- Electrical & Mechanical System
3. The students will be able to analyze the stability of given system in Time domain and Frequency domain.

SECTION – I

Unit 1: Introduction to Feedback Control System (9Hrs)
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.

Unit 2: Time Domain Analysis (7Hrs)
Type and order of a system , time domain analysis of system ,typical test input signals ,response of first order systems to unit step, unit ramp, and unit impulse signals ,step response of second order systems ,performance characteristics of feedback control systems , time domain behavior from pole-zero plot

Unit 3: Stability Analysis: **(8Hrs)**

Concepts of Stability**:** BIBO stability – asymptotic stability – Routh Hurwitz stability criterion – relative stability, Steady state error for unity feedback systems, static error constants and system type, steady state error specifications. Root locus techniques- Basic concept, rules for construction of Root Locus, application of root locus techniques for control system.

SECTION – II

Unit 4: Frequency Domain Analysis **(9Hrs)**

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.

Unit 5: Analysis of control system in state space **(7Hrs)**

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

Unit 6: Compensators & controllers **(7Hrs)**

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

Text Books:

1. R. Anandanatarajan, P. Ramesh Babu , "Control Systems Engineering", Scitech Publications
2. S.K. Bhattacharya, "Control Systems Engineering", 1st edition, Pearson education

Reference Books:

1. I.J. Nagrath, M.Gopal "Control Systems Engineering", 5th Edition, New Age International Publication
2. Schaums Series book "Feedback Control Systems".
3. Norman S. Nise "Control Systems Engineering", 4th edition, Wiley edition.

Term work: It should consists of minimum 8 experiments out of which 5 should be hardware based and 3 simulation type. List is given for reference.

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. Pole –Zero map plotting in order to find out stability
3. To find out Steady State Error From a given Transfer function
4. Draw a root locus of any system.
5. Draw a Bode Plot.
6. Draw a Polar Plot.
7. Draw a Nyquist Plot.
8. Obtain a transfer function from state space model.
9. Check the controllability and Observability of system.

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T.E. Electrical & Electronics Engineering Part-II

6. COMPUTER LAB

Teaching Scheme:
Practical: 2Hour/week

Examination Scheme:
Term Work: 50 Marks

Course Objectives:

1. To provide students with a hands-on introduction to MATLAB and SIMULINK platform
2. To demonstrate the use of MATLAB and SIMULINK as a tool to simulate electronic circuits
3. To demonstrate the use of OrCAD/PROTEUS as a tool to simulate electronic circuits

Course Outcomes:

1. Students can write program using different features of MATLAB
2. Students can use simple SIMULINK blocks along with MATLAB program
3. Students can simulate different electronic circuits using MATLAB
4. Students can simulate different electronic circuits using

Unit 1: MATLAB Fundamental: **(4Hrs)**

MATLAB Environment, constants, variables and expressions, operators, matrix operations, vectors, complex numbers, math functions, input –output, control structures-loops and branching

Unit 2: MATLAB Functions: **(4Hrs)**

M files and script files, function subprograms, types of functions, functions handling, errors and warnings, MATLAB debugger.

Unit 3: MATLAB Graphics: **(4Hrs)**

Two dimensional plots, multiple plots, sub plots, specialized two dimensional plots, three dimensional plots.

SECTION - II

Unit 4: Simulation using MATLAB: **(6Hrs)**

Introduction to Simulink, modeling, commonly used blocks, Simulation using MATLAB / Simulink - rectifiers, filters, series and parallel circuits, validation of network theorems, resonance circuits, any other circuits / concepts covered in Electronic Circuit Analysis and Design and Network Theory and Analysis courses

Unit 5: Simulation using other software simulation tools: (6Hrs)
Simulation of circuits using software simulation tool like OrCAD / PROTEUS – multistage transistor amplifiers, feedback amplifiers, power amplifiers, oscillators, multivibrators, Op amp configurations, Op amp applications, active filters, any other circuits / concepts covered in Electronic circuit analysis and design II and Linear integrated circuits courses

Text books:
1. MATLAB and its application in Engineering, R.K.Bansal, A.K.Goel and M.K.Sharma, Pearson Education
2. MATLAB & Simulink, Agam Kumar Tyagi, Oxford University Press
3. Getting starting with MATLAB-7, Rudra Pratap, Oxford University Press

Reference books:
1. MATLAB and SIMULINK manuals
2. OrCAD/ PROTEUS manual

Term work: Term work shall consist of minimum ten experiments based upon

1. MATLAB Programming – Students shall solve/simulate simple electronic circuit related problems to learn various MATLAB features / concepts
2. Simulation of circuits / concepts covered in Electronic Circuit Analysis and Design I and Network Theory and Analysis Course using MATLAB/ SIMULINK
3. Simulation of circuits / concepts covered in Electronic Circuit Analysis and Design II and Linear Integrated Circuits courses using OrCAD/PROTEUS

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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:
Theory : 100 Marks
T.W. : 25 Marks
POE : 50 Marks

Course Objectives:

1. To make the students understand various Power semiconductor devices
2. To make the students aware about applications of Thyristor.
3. The make the students analyze Choppers, Converters, cycloconverter and Invertors.

Course Outcomes:

1. The student will be able to explain characteristics & applications of Power semiconductor Devices.
2. The students will be able to analyze Choppers, Converters, cycloconverter and Invertors

SECTION-I

Unit1: 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, Series & parallel operation of SCR, Construction, characteristics, Rating and Application of DIAC, TRIAC comparison between SCR, DIAC & TRIAC.

Unit 2: Power Semi-conductor Devices: (4Hrs)

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

Unit 3: Thyristor Application: (5Hrs)

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

Unit 4: Phase Controlled Rectifier: (6Hrs)

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

Unit 5: Choppers: **(8Hrs)**

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

Unit 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.

Unit 7: Inverter: **(8Hrs)**

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

Text Books:

1. Power Electronics, P.S. Bimbhra, 3rd , Edition, Khanna Pub., New Delhi, 1999.
2. Power Electronics, M.D. Singh and K.B. Khanchandani, Tata Mc-Graw-Hill, New Delhi, 1998.

Reference books:

1.Power Electronics Circuits, Devices, and Application, M.H. Rashid, 2nd Edition, Prentice Hall of India, New Delhi, 1999.
2. 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:
Lecture: 4 Hours /week

Examination Scheme:
Theory : 100 Marks
TW : 25 Marks

Course Objectives:

1. To make the students understand Communications Systems.
2. To make the students well familiar about Amplitude, Frequency Modulation and Demodulation.
3. To make the students comprehend with the concept of Digital data transmission and Probability.
4. To make the students aware about Mobile Communication and cellular concept.

Course Outcomes

1. The students will be able to explain Modulation and Demodulation concept in Amplitude and Frequency.
2. The students will be able to explicate the different signals operation and classification of communication systems.

SECTION – I

Unit 1: Review of Signals & Introduction to Communication System (9Hrs)
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.

Unit 2: Amplitude Modulation & Demodulation (8Hrs)
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

Unit 3:Frequency Modulation & Demodulation (7Hrs)
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

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

Unit 5: Concept of Digital Data Transmission (8Hrs)
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.

Unit 6: Probability (4Hrs)
Probability, Random variable, probability density, mean, moments, transformation of random variables, stationary Process, mean, autocorrelation and covariance functions.

Unit 7: Introduction to Mobile Communication and Cellular Concepts (4Hrs)
Block Diagram, Data Technologies, Mobile and wireless devices, cellular concept, frequency reuse, channel assignment, hand-off and multiple access technologies.

Text Books:

1. Digital & Analogy Communication system-K.Sam Shanmuyan,Wiley
2. Electronic communication system –Kennedy, Davis TATA MCGRAW Hill.
3. Mobile and personal communication Systems and Services- Raj Pandya

Reference Books:

1.Modern Digital and Analog Communication systems B.P. Lathi, 3rd Edition, Oxford University Press 1998.
2.Communication Electronics, L.F. Frangel, Tata McGraw Hill 2002
3.Simon Haykin “Communication Systems” John Wiley & Sons

Term Work: It should consist of minimum eight assignment based on above syllabus.

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T.E. Electrical & Electronics Engineering Part-II

3. POWER SYSTEM ANALYSIS

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

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

Course Objectives:

1. To make the students represent Power system components.
2. To make the students solve Power flow equations & solution techniques.
3. To make the students analyze symmetrical components and Unsymmetrical fault analysis.

Course Outcome:

1. The students will evaluate power system using Gauss-Seidal method & Newton-Raphson method.
2. The students will be able to analyze symmetrical and unsymmetrical fault and solve Numerical on them.

SECTION-I

Unit 1:Representation of Power System Components: **(4Hrs)**
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

Unit 2:Network Calculations: **(6Hrs)**
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

Unit 3: Load Flow Study: **(6Hrs)**
Power flow equations & solution techniques, Gauss-Seidal method, newton-raphson methods, Decoupled & fast Decoupled methods, comparison of load flow methods

Unit 4: Power System Stability: **(7Hrs)**
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

Unit 5: Symmetrical Fault Analysis: **(7Hrs)**
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

Unit 6: Symmetrical Components: **(8Hrs)**
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.

Unit 7. Unsymmetrical Fault Analysis: **(9 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

Text Books:

1.Power System Analysis by I.J Nagrath & D B Kothari, TMH publication, 3rd addition, 2003
2.Electrical Power System by Ashfaq Husain, CBS, 5th Edition
3.Electrical Power System by C.L.Wadhwa, New Age International, Publication (2005)

Recommended Books:-

1. Elements of Power System analysis by Stevensons, TMH publication, 3rd Edition
2. Modern Power System Analysis by D.P Kothari and I.J Nagrath 4th edition,TMH Publication
3. Electric Power Transmission & Distribution, S. Sivanagaraju, S. Satyanarayana, Pearson Education publication

Term-Work:-
Minimum 8 Experiments/ Drawing sheets based on above syllabus.

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T.E. Electrical & Electronics Engineering Part-II

4. CONTROL SYSTEM-II

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

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

Course Objectives:

1. To make the students design compensators using Root locus and frequency response.
2. To make the students well familiar about the concept of State space analysis and design.
3. To make the students understand the concept of nonlinear digital control system and classification.
4. To make the students gain knowledge of discrete time control system and deigning of discrete time control system.

Course Outcomes:

1. The students will be able to design Compensator using Root locus and Frequency Response.
2. The students will be able to explain different non linearites in Control System.
3. The students will be able to explain discrete time control system and deigning of discrete time control system.
4. The students will be able to solve numerical on State space analysis.

SECTION-I

Unit 1: Design of compensator using Root Locus (7 Hrs)

Introduction of design problem, Approach & preliminary considerations, Design of lead, lag & lag-lead compensators, compensation

Unit 2: Design of compensator using Frequency response (8 Hrs)

Transient response through gain adjustment, lag compensation, lead compensation, lag-lead compensation

Unit 3: State-Space Analysis & Design (9 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

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

Unit 5: Discrete-time Control System (9Hrs)
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.

Unit6:Design of Discrete-time Control System (8Hrs)
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.

Text Books:
1. Control System Engineering- IJ Nagrath & M Gopal New Age Publishers 5th Ed
2. Continuous and Discrete Control System by John F. Dorsey-TMH (IE)
3. R. Anandanatarajan, P. Ramesh Babu , "Control Systems Engineering", Scitech Publications

Recommended Books:-
1. Modern Control Engineering- K.Ogata, Prentice Hall India, 4th Ed
3. Discrete-time Control Systems by K Ogata, Prentice Hall India, 2nd Ed

Term-Work:-
Term-work shall consist of eight experiments 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:
Theory : 100 Marks
TW : 25 Marks
POE : 50 Marks

Course Objectives:

1. To make the students understand Architecture and Instruction Set of microcontroller 8051.
2. To make the students realize Assembly language programming.
3. To make the students proverbial about real world interfacing techniques and assembly language programs.

Course Outcomes:

1. The students will be able to do assembly language programming of 8051.
2. The students will be able to perform Real world interfacing of 8051.
3. The students will be able to explain different applications of Microcontroller.

SECTION -I

Unit 1: 8051 Architecture: **(8Hrs)**
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.

Unit 2: Assembly Language Programming: **(8Hrs)**
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.

U nit 3: Microcontroller based system design: **(8Hrs)**
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

Unit 4: Real World Interfacing I: **(8Hrs)**

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.

Unit 5: Real World Interfacing II: **(8Hrs)**

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

Unit 6: Microcontroller Applications: **(8Hrs)**

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.

Text Book:

1. The 8051 Microcontroller Architecture, Programming and Applications, Kenneth Ayala, 2nd Edition, Penram International
2. Microcontroller and its application , Ajay deshmukh, TATA McGraw Hill

Reference Books:

1. The 8051 Microcontroller and embedded systems, Muhammad Ali Mazidi, Pearson Education
2. Programming and customizing The 8051 Microcontroller, Myke Predko,TATA McGraw Hill
3. Introduction to Microconroller and their Applicaton T.R Padmanabhan,Narosa

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.

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T.E. Electrical & Electronics Engineering Part-II

6. MINI HARDWARE PROJECT

Teaching Scheme:
Practical: 2Hour/week

Examination Scheme:
Term Work: 50 Marks

Course Objectives:

1. To initiate the Students with research work.
2. To make the students design and fabricate hardware project in the field of analog, digital systems & Microprocessors.
3. To make the students work in group.

Course Outcome:

1.The students will be able to simulate hardware project.
2.The students will be able to design and fabricate hardware projects.
3.The students will be able to prepare report based on their project.

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

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T.E. Electrical & Electronics Engineering Part-II

Self Learning (Technical):1

INDUSTRIAL MANAGEMENT

Examination Scheme:
Theory: 50 Marks

Unit 1: Introduction to Management and Marketing
Introduction to management, evolution of scientific management, modern management Principles, Elements of management, Planning, organizing, staffing, directing, coordinating, reporting, budgeting. Core concepts of marketing, need, want, demand, product, value, satisfaction, marketing mix- product, price, place, promotion.

Unit 2: Financial & product Management
Financial management, objectives, scope, techniques of investment analysis, pay back period, accounting rate of return, working capital, cost of capital. Sources of financing. Product design .Types of production system. Plant location-factors to be considered. Plant layout, Types of layout. Inventory management.

Unit 3:Human resource
Significance of HRM.HR planning job evaluation. Recruitment and selection. Placement and induction. Training. Performance appraisal.Compensation.Industrial relations.

Unit 4: Global Economics:-
Impact of liberalization, privatization and globalization. Locating the firm in a global economy, Fiscal policy, Taxation-principles ,Exchange rate determination, Monetary policy. Functions of banks. Credit creation by commercial banks.

Text Books:-
1. L.M.Prasad, Priciples and Practice of Management, S.Chand& Sons.
2. P.Kotler, Marketing Management (12/e), Pearson, 2005
3. S.K.Misra&V.K.Puri, Economic Environment of Business, HPH, 2003

Reference Books:-
1. P.Chandra, Financial Management Theory and Practice (3/e), TMH, 2004
2. K.Ashwathappa, Human Resources and Personnel Management (3/e),TMH, 2005
3. E.S.Buffa&R.K.Sarin, Modern Production/Operation Management (8/e), Wiley, 1994.
4. M.Adhikari, Business Economics, Excel Books, 2004

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T.E. (Electrical & Electronics Engineering) – Part II

Self Learning (Technical):2

SPECIAL MACHINES

Examination Scheme:
Theory: 50 Marks

Unit 1:Stepper Motors:-
Introduction, Stepper Motor, Step Angle, Application and Types of Stepper Motor - Variable Reluctance & Permanent Magnet stepper motor

Unit 2:Servo Motors:-
Construction, Working, Application and Types of Servo Motor –AC Servo motor & DC Servo Motor

Unit 3: Synchros:-
Constructional Features, Working and Application Of Synchros a) Torque Transmission b) Error Detection

Unit 4: Special Purpose Motors:-
Brushless DC Motor and Schrage motors Operation, working principle, Characteristics and Applications

Text Books:-

1. Principles of electrical machines by V.K. Mehta, Rohit Mehta, S. Chand Publication
2. A textbook of Electrical Technology Vol.II by B.L. Theraja& A.K. Theraja. S. Chand Publications
3. Electrical Circuit & Machine by U.A. Bakshi, V.A. Bakshi, Technical Publication

Reference Books:-

1. Theory & performance of Electrical Machines by J.B. Gupta, S.K. Katariya & Sons.
2. Principle of Electrical Machinesby P.C. Sen, Wiley India, 2nd edition.

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T.E. (Electrical & Electronics Engineering) – Part II

Self Learning (Technical):3

MOBILE AND SATELLITE COMMUNICATION

Examination Scheme:
Theory: 50 Marks

Unit 1: Introduction to Mobile Communication:-
Block Diagram, Data Technologies, Mobile and wireless devices

Unit 2:Cellular Concepts:-
Cellular concept, frequency reuse, channel assignment, hand-off and multiple access technologies.GSM-Services and features of GSM

Unit 3: **Introduction to Satellites:-**
Satellite Frequency Bands, Satellite Systems, Multiple Access, Frequency Rouse by orthogonal Polarizations, Advent of Digital Satellite Communications, Satellite Description, Earth Station. types of Demand Assignments, Massage Transmission by FDMA, Massage Transmission by TDMA, Satellite Packet Switching.

Unit 4: Satellite Transponder and link:-
Transponder Model , Satellite signal Processing, RF-RF Translation, IF Demodulation, Interference Analysis, Rain Induced Attenuation, Rain Induced Cross-Polarization Interference, System Availability, Satellite Link Design.

Text Books:-

1. Mobile and personal communication Systems and Services- Raj Pandya (Prentice Hall of India)
2. Mobile Communications (2nd Edition)-Jochen Schiller (Pearson Education.)
3. Digital Satellite Communications (Second Edition) Tri, T.Ha. 1990.

Reference Books:-

1. Introduction to Radar Systems, by Merill. I Skolnik.
2. Satellite Communications – Timothy Pratt, Charles Bostian, Jeremy Allnutt John Wiley & Sons (II Edition)
3. Satellite Communication-MonojitMitra (PHI)
4. Satellite Communications – Dennis Roody (McGraw Hill)

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T.E. (Electrical & Electronics Engineering) – Part II

Self Learning (Technical):4

ELECTRICAL ENGINEERING MATERIALS

Examination Scheme:
Theory: 50 Marks

Unit 1:Introduction to Electrical Materials:
Engineering materials, Classification, properties, Energy bond description.

Unit 2: Conductive materials:
Ohm's law and relaxation time of electrons, relaxation time, collision time and mean free path Electric scattering and resistively of metals Heat developed in current carrying conductor, Thermal conductivity of metals, Superconductivity, cryoconductors.

Unit 3: Dielectric Materials-I:
Dielectric properties in static field: Polarization and its mechanism, dielectric constant of monoatomic gases
a) Dielectric breakdown in liquid: colloidal theory, Bubble theory, Breakdown due to liquid globules.
b) Dielectric breakdown of solid: Intrinsic breakdown, Frochlich's theory, Theory of Van Hippel, Thermal and discharge breakdown.
c) Dielectric breakdown in gases : Growth of current, breakdown mechanism, electron ionization coefficient, secondary ionization coefficient, Townscnd's criterion

Unit 4: Dielectric Materials-II:
Dielectric properties in alternating field: Frequency dependence of electronic polarisiblity, ionic polarization as function of frequency, complex dielectric constant of non dipolar solids, dielectric losses.

Text Books:-
1.Electronic Engineering Materials and devices : J.Allison , Mc-Grawhill Pub.
2. Electric and radio engineering materials: B. M. Tareev, Mir Publication

Reference Books:-
1. Electric engineering Materials: A. J. Dekker , Prentis Hall Publication