Solapur University, Solapur
Structure of T.E.(Electronics Engineering) Part I & II
w.e.f. Academic Year 2009-10.

T.E.(Electronics Engineering) **Part -I**

Sr. No.	Subject	Teaching Scheme				Examination Scheme				
		L	T	P	Total	TH	TW	POE	OE	Total
1.	Control Systems	3	1	2	6	100	25	--	--	125
2.	Digital Signal Processing	4	--	2	6	100	25	--	25	150
3.	Microprocessors and Interfacing	4	--	4	8	100	25	50	--	175
4.	Electro Magnetic Engineering	4	--	--	4	100	25	--	--	125
5.	Industrial Economics and Management	3	1	--	4	100	25	--	--	125
6.	Computer Lab	--	--	2	2	--	25	--	25	50
	Total	**18**	**02**	**10**	**30**	**500**	**150**	**50**	**50**	**750**

T.E.(Electronics Engineering) **Part -II**

Sr. No.	Subject	Teaching Scheme				Examination Scheme				
		L	T	P	Total	TH	TW	POE	OE	Total
1.	Operating Systems	3	--	2	5	100	25	--	--	125
2.	Digital Communcation	3	--	2	5	100	25	--	25	150
3.	Micro controllers	4	--	2	6	100	25	50	--	175
4.	Industrial Electronics	4	--	2	6	100	25	--	25	150
5.	VLSI Design	4	--	2	6	100	25	--	--	125
6.	Mini Hardware Project	--	--	2	2	--	25	--	--	25
	Total	**18**	**--**	**12**	**30**	**500**	**150**	**50**	**50**	**750**

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 students, then a new batch may 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.

TE(Electronics Engineering) Part – I

Control Systems

Lecture: 3 Hours / Week **Theory : 100 marks**
Practical: 2 Hours / Week **Term work : 25 marks**
Tutorial: 1 Hour / Week

Section I

1) Introduction: Types of control systems, examples of control systems: Liquid level control system, position control system, missile launching and guidance system and automatic aircraft landing system. Transfer function of closed loop system. **(3)**

2) Mathematical modeling and system representation:

Mathematical modeling of mechanical systems using mass, spring and damper.
Mathematical modeling of Electrical systems using R, L and C.
Transfer function of RLC circuits.
Transfer function using block diagram reduction techniques & Signal Flow Graph- using Mason's Gain formula **(7)**

3) Control system components: Working principle, construction, types and applications of following control system components
Stepper motor, AC and DC servomotor, Synchro, Potentiometer and Tacho-generator.
Transfer function of Field controlled & Armature controlled DC servomotor.
Controllers- P, PI, PID controllers. **(8)**

4) Stability analysis: concept of stability, absolute and conditional stability, relative stability, Routh – Hurwitz criterion for stability. **(3)**

Section II

5) Time response of systems: Standard test signals, Time response of first order systems to step, ramp and impulse input. Step response of second order system, time domain specifications, steady state errors and error constants of type 0 , type1 and type2 systems **(5)**

6) Root locus: Concept of root locus, construction of root locus and stability analysis using root locus. **(5)**

7) Frequency domain analysis: frequency response specifications, co-relation between time domain and frequency domain response, Bode plot : asymptotic bode plot, stability analysis using bode plot. **(5)**

8) Compensators: Need of compensator , lag compensators, lead compensa[1]tors, lag-lead compensator. **(3)**

9) Programmable Logic Controllers: Basic Configuration of PLC, Specifications, Programming of PLC , Ladder diagram, Application of PLC. **(3)**

- **Term work:**
  Term work consists of minimum eight experiment from below list :

1. To verify potentiometer as transducer and error detector.
2. To verify Synchro as transducer & error detector.
3. AC position control system
4. DC position control system
5. Effect of type of feedback on control system
6. Time response of first order system
7. Step response of second order system using R, L and C
8. Frequency response of second order system using R, L and C
9. PLC Programming.
10. Application of PLC.
11. Time Response & Root locus using MATLAB
12. Bode plot, Lag-Lead compensator using MATLAB

- **Referred Books :**

2. Control Systems Engineering, I. J. Nagrath & M Gopal, New Age International Publication(5^{th} Edition)
3. Feedback & Control Systems, Schaum's Outline Series, McGraw Hill
4. Automatic Control Systems, B. C. Kuo, PHI Publication
5. Modern Control Engineering,K.Ogata, Pearson Education

T.E. (Electronics)- Part I
DIGITAL SIGNAL PROCESSING

Lecture : 4 Hours / week	**Theory : 100 marks**
Practical : 2 Hours /week	**Term Work : 25 marks**
	Oral : 25 marks

Section I

1. DSP System concept, DT signals, co-relation of DT signals. **(2)**

2. Z – transform & properties overview, Digital transfer function, Stability considerations & frequency response. **(3)**

3. The Discrete Fourier Transform and Fast Fourier Transform :
DFT , Relation between DFT & Z- Transform , Properties of DFT, Circular convolution Fast convolution techniques(Overlap add & overlap save), Frequency analysis of signals using DFT, FFT Algorithms (DIT FFT & DIF FFT) **(12)**

4. Realization of Digital Linear Systems :
Structures for realization of Discrete time systems
Structures for FIR Filters : Direct form , Cascade form & Lattice structure.
Structures for IIR filters : Direct form , signal flow graph & transposed structure, cascade form & parallel form. **(7)**

Section II

5. FIR Filter design :
Characteristics of FIR filters, Properties of FIR filters, Windowing method & frequency sampling method of filter design, Finite word length effects in FIR filters , FIR implementation techniques. **(7)**

6. IIR filter design :
Impulse Invariant technique, Bilinear transformation, Frequency transformations, Analog filter approximation (Butterworth), Finite world length effects in IIR filters, Implementation of IIR filters. **(7)**

7. Introduction to Programmable Digital Signal Processors:
Basic Architectural features, Multiply and accumulate (MAC) unit, Bus Architectures, VLIW Architecture, Special addressing modes, Fixed point and Floating point digital Signal Processors, Overview of TMS320C54x DSP Architecture **(6)**

8. Applications of DSP in Audio processing , Biomedical & Image Processing**.** **(4)**

- **Term work** : Term Work consists of minimum eight experiments based on above syllabus.

- **Referred Books**

1. Digital Signal Processing – Principles, Algorithms and applications by John G Proakies,PHI
2. Digital Signal Processing - A Practical Approach by Ifeachor E. C. & Jervis B. W. ,Pearson Education
3. Digital Signal Processing by S Salivahanan , A Vallavaraj & C Gnanapriya,TMH
4. Digital Signal Processing Implementations using DSP Microprocessors by Avtar Singh & S. Srinivasan,Thomson
5. Digital Signal Processors – Architecture , Programming and applications by B Venkataramani & M. Bhaskar,TMH
6. Scientist and Engg. Guide on Digital Signal Processing
7. Discrete time signal Processing by A.V. Oppenheim & R.W.Schalfer, John Wiley
8. Digital Signal Processing – a system design approach by D. J. Defata, John Wiley
9. Digital Signal Processing Fundamentals and applications by Li Tan, Academic Press

T.E. (Electronics)- Part I
Microprocessors & Peripherals

Lecture : 4 Hours/week **Theory : 100 Marks**
Practical : 4 Hours/week **Term Work : 25 Marks**
Practical & Oral : 50 Marks

Section I

1> Semiconductor Memories – RAM, ROM, PROM, EPROM, EEPROM, timing characteristics, memory organization, decoding techniques, EPROM programming **(5)**

2> Fundamentals of 8085 Microprocessor – Architecture, instruction set, addressing modes, demultiplexing of address and data, generation of control signals, timing diagram for different instructions, programming, single cycle and single stepping, stack and subroutine, interrupts, hold and halt states, state transition diagram **(15)**

3> Interfacing memory – Interfacing program and data memory, interfacing slower memories with wait stats, memory organization and mapping **(5)**

Section II

4> Interfacing Input / output devices – Input / output ports, I/O mapped I/O, memory mapped I/O, I/O instructions with timing diagram, status check and interrupt based data transfer **(4)**

5> PPI 8255 – Internal block diagram, interfacing with 8085, modes, programming **(3)**

6> Interfacing Devices – Interfacing through 8255 – keyboard, displays, stepper motor, Centronix type printer **(5)**

7> Data Conversion Techniques - DAC techniques- R2R, ladder network, DAC specifications, ADC techniques – Flash, single slope, dual slope, successive approximation, ADC specification, interfacing DAC 80808 and ADC 0808 with 8085 **(5)**

8> Programmable Timer / Counter 8253 - Internal block diagram, interfacing with 8085, modes, programming **(4)**

9> Serial Communication – Basics of serial communication, types, modem, serial communication using SID and SOD, 8251 USART- Internal block diagram, interfacing with 8085, modes, programming, RS 232 standard. **(4)**

- **Term Work –**

- Minimum 15 experiments as detailed below with minimum 5 experiments based on interfacing and peripherals
- Minimum 3 experiment on PC with IDE / simulator

1. Programs based on addressing modes, arithmetic and logical instructions
2. Programs 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. Programs based on stack and subroutine
8. Program based on interrupt
9. Hardware interfacing – static display, dynamic display, stepper motor, DAC, ADC, printer, 8253, 8251

- **Referred Books –**

1. Microprocessors architecture, programming and applications with 8085A – Ramesh S. Gaonkar.
2. Intel Microprocessor peripheral hand book, application notes.
3. Microprocessors and peripheral by S.P.Chaudhry,Sumitra Chaudhry.

T.E.(Electronics) Part-I
Electromagnetic Engineering

Lecture: 4 Hours /week **Theory : 100 Marks**
Term Work : 25 Marks.

Section I

1. Electrostatics: **(12)**

Review of vector Analysis and coordinate systems and coordinate Transformation
1. Coulomb's law & electric field, field due to distributed charges.
2. Flux density, Gauss's law and its applications, divergence theorem.
3. Electrostatic potential, potential gradient, electric dipole.
4. Electrostatic energy density
5. Boundary conditions for electrostatic field.

2. Steady Magnetic Field **(7)**

1. Biot Savarts law.
2. Ampere's circuital law, Stroke's Theorem.
3. Magnetic flux density & Vector magnetic potential.
4. Current carrying conductors in magnetic fields, Torque on loop.
5. Energy stored in magnetic field.
6. Boundary conditions for magneto static field.

3. Maxwell's Equations: **(5)**

1. Continuity equation for static conditions.
2. Displacement current and Current Density.
3. Maxwell's equations in integral form and point form.
4. Maxwell's equations for static case, Time varying field, harmonically varying field.

Section II

4. Electromagnetic Waves: **(10)**

1. Wave propagation in dielectric & conducting media.
2. Modification in wave equations for sinusoidal time variations.
3. Propagation in good conductor, Skin effect, Reflection of uniform Planes and SWR
4. Poynting theorem.
5. Power flow in uniform plane wave.

5. Transmission Lines: **(7)**

1. Transmission line equation.
2. Transmission line parameters.
3. The terminated uniform transmission line.
4. Reflection coefficient, VSWR, group velocity, phase velocity.
5. Smith chart introduction and related tips.(stub matching is not Expected)

6) Antenna & Radiating Systems: **(7)**

1. Review of Basic antenna parameters.
2. Polarization
3. The alternating current element.
4. Power radiated by current element.
5. Generalized linear antenna.
6. Dipole antenna – Directional Properties.
7. Wire antenna, Monopole antenna, Horn antenna
8. Liner arrays

- **Term work** : Term Work consists of minimum Ten assignments based on above syllabus

- **Books Referred –**

1. Electromagnetic Engineering- John D. Kraus[Mc Graw Hill.]-Fourth Edition
2. Electromagnetic Engineering. -William [Hyte Mc Graw Hill.] – Seventh Edition
3. Electromagnetic Fields & Radiation Systems -Jordan & Balmain[PHI.] – Second Edition
4. Field & Wave Electromagnetic -David K Cheng [Pearson Education]
5. Elements of Electromagnetic - Sadiku [Oxford University Press.]
6. Applied Electromagnetic theory analysis, Problems and application by Nair and Deepa.
7. Electromagnetic Engineering-J A Edmininister- Second Edition
8. Antennas for all applications- John D. Kraus[Mc Graw Hill.]-Third Edition

T. E. (Electronics) Part – I
Industrial Economics & Management

Lecture: 3 Hours / Week **Theory : 100 Marks**
Tutorial: 1Hour / Week **Term Work : 25 Marks**

Section I

1. **Introduction –** Software & applications, software project and its importance, comparison with other projects, software process models – Waterfall, V process, Spiral, software life cycles **(5)**

2. **Overview of Project Management –** project activities, plans and methods, categories, activities, categories, problems, objectives, stakeholders, requirement specifications, control, brief overview of steps in planning **(5)**

3. **Programme Management –** Allocation of resources, creating programme, aids, economic benefits and analysis **(4)**

4. **Estimation –** risk analysis, choosing technologies, software estimation and techniques software and hardware prototyping **(4)**

Section II

5. **Activity Planning –** Objectives, approaches, scheduling, network planning models, timelining, forward and backward pass, critical path analysis , resource requirements & scheduling **(6)**

6. **Monitoring and Control –** Framework, data collection and reporting, visualization methods, cost monitoring, dealing with slippage , change control **(4)**

7. **Organizational Behavior –** Organizational structure, working in a team and multiculture , leadership & decision making, dealing with stress, health and safety, ethics in project **(4)**

8. **E Commerce –** Changing face of business, E commerce growth, advantages, keys to success, business to business E commerce, key resources – information, people & technology, role & goals of information technology **(4)**

- **Term work** : Term Work consists of minimum Eight assignments based on above syllabus

- **Books Referred :**

1. Software project management, Bob Houghes, Mike Coterell, Tata McGraw-Hill, Fourth Edition
2. Information technology project management, Providing measurable organizational value, Jack M. Marchewka, Wiley India, Second Edition
3. Software project management in practice, Pankaj Jalote, Pearson Education
4. Software engineering a practitioner's approach, Roger S. Pressman, McGraw-Hill international, Fifth Edition
5. Management information systems for the information age – Stephen Haag, Maeve Cummings, Donald J. McCubbrey, Tata McGraw-Hill Publishing Company Ltd, Fourth Edition

T.E. (Electronics) Part-I
Computer Lab

Practical: 2 Hours / week **Term Work: 25 Marks**
Oral : 25 Marks

- **Term Work consists of minimum Ten practicals based on coverage of below C^{++} aspects:**

1. Classes.
2. Private, public, protected data members and functions.
3. Operator overloading.
4. Inline function.
5. Function overloading.
6. Pointers to class members.
7. Constructors and destructors.
8. Static member function.
9. Concept of friend function.
10. Single level, multilevel and multiple inheritances.
11. Virtual base class.
12. Virtual function.
13. Templates and exception handling.
14. Stack using class.
15. Queues using class.

- **Books Referred :**

1. Programming with C++, Ravichandran D, Tata McGraw Hill Publication, New Delhi, Second Edition
2. Object oriented programming, C++ ,E. Balagurusamy, Tata McGraw Hill Publication, New Delhi
3. Turbo C++ Techniques and application, Scoot, Robert Ladd, BPB Publication New Delhi
4. Mastering C++, K.R. Venugopal T. Ravishankar, Rajkumar, Tata McGraw Hill Publication, New Delhi
5. Data Structures using C and C++, Yedidyah Langsam, Moshej Augenstein, Aaron

T.E. (Electronics) Part – II
Operating Systems

Lecture: 3 Hours / Week — Theory : 100 Marks
Practical: 2 Hours / Week — Term Work: 25 marks

Section I

1. **Introduction** : Basics of operating system, Simple Batch System, Multi-programmed Batch System ,Time Sharing System, Personal Computer System, Parallel System, Real Time System, System Calls. **(4)**

2. **Process:** Process Concept , Process Scheduling, Operation on process ,Cooperating process , Threads , Inter-process Communication **(5)**

3. **Process Scheduling**: Basic concept, Scheduling Criteria, Scheduling Algorithms, Multiple processor scheduling, Real time scheduling**.** **(4)**

4. **Inter-process synchronization**: Background, Classical problems of synchronization, Critical Region, The critical section problem, Synchronization Hardware Monitors, Semaphores. **(5)**

Section II

5. **Deadlocks**: System modes, Deadlock characterization, Methods for handling deadlocks Deadlock prevention, Deadlock avoidance, Deadlock detection Recovery from deadlock, combined approach to dead lock. **(6)**

6. **Memory management**: Background, Logical Versus Physical Address space, Swapping Contiguous Allocation, Paging, Segmentation, Segmentation with paging. **(4)**

7. **Virtual Memory**: Background, Demand paging, Page replacement, Page replacement algorithms, Allocation of frames, Thrashing, Demand segmentation. **(4)**

8. **I/O system**: Overview, I/O hardware, Application I/O interface, Kernel I/Subsystem, Transforming I/O request to hardware operation. **(4)**

- **Term work** : Term Work consists of minimum Eight practicals based on above syllabus

- **Books Referred**

1. Operating System concepts ,6th Edition , Silberschatz Galvin , John Wiley
2. Operating systems-Concept and design, Milan Milenkovic's, TMGH
3. Operating Systems- A concept based approach, D M Dhamdhere, TMGH

T.E. (Electronics) Part-II
Digital Communication

Lecture : 3 Hours / Week **Theory : 100 Marks.**
Practical : 2 Hours /Week **Term Work : 25 Marks.**
Oral : 25Marks.

Section I

1.Pulse Modulation: (9)

Sampling Theory, Nyquist rate ,Aliasing, PAM modulation and demodulation, PTM modulation and Demodulation, Introduction to Digital Communication, PCM-Quantization, uniform, non-uniform and differential quantization, PCM bandwidth requirement, PCM-TDM,ISI, Companding, Eye Diagrams, Equalization.

2. Information Theory and Channel capacity.- (6)

Introduction to information theory, average and mutual information. Entropy, Joint entropy and conditional entropy, Rate of information, redundancy, channel capacity, Shannon's Theorem, Shannon – Harley theory, bandwidth, S/N trade off, entropy coding.

3. Waveform Coding :- (6)

DPCM, ADPCM, DM, ADM, Noise in DM, CVSD.

Section II

4. Digital Carrier Modulations and Detection: (7)

Binary ASK , PSK , FSK schemes , Probability of error , Coherent PSK & FSK, Differential coherent PSK, Non coherent FSK, Comparison of digital modulation schemes–Bandwidth & power requirements, Equipment complexity , M-ary signaling schemes – M–ary coherent PSK , M-ary differential PSK , M-ary wideband FSK, Synchronization methods, QAM.

5. Error control coding: (10)

Types of error & codes, Linear Block Codes - Error Detection & Correction, Hamming codes, Table Lookup Decoding, Binary cyclic codes – Algebraic Structure, Encoding using (n-k) bit shift register, Syndrome Calculation, BCH code, Burst error & Random error correcting codes, Convolution codes – Encoders & Decoders

6. Optimum Receiver for Digital Modulation: (4)

Matched filter receiver, Correlation receiver, Synchronization, Symbol Synchronization, Frame synchronization, Carrier recovery circuits.

- **Term work** : Term Work consists of minimum Eight practicals and Two experiment on Matlab platform based on above Syllabus

- **Books Referred**

1. Digital & Analog Communication systems , K. Sam Shanmugan, Wiley
2. Principles of communication system, Taub & Schling.
3. Digital Communication System Design , M.S. Roden.
4. Digital Communication , Simon Hykin.
5. Communication System Analog & Digital, Singh & Sapre.
6. Digital Communication, Proakis.
7. Digital communication, Bernard Sklar & Pabitrakumar Ray

T.E. (Electronics)-II
Microcontrollers

Lecture: 4 Hrs/Week
Practical: 2 Hr/week

Theory : 100 Marks
Term Work : 25 marks
Practical & Oral : 50 Marks

Section-I

1. Introduction to 8051 (08)

Difference between Microprocessors and Microcontrollers. RISC and CISC Architecture, 8051-Features, Architecture, Addressing modes, Instruction set, Assembly language programming.

2 : On-chip peripherals (06)

Port Structure, Timers and Counters, Serial Port , Interrupt Structure

3 : Interfacing and assembly language programming (08)

Interfacing of different display devices like LED's, Seven Segment and LCD , Memory, ADC, DAC Stepper Motor, Serial communication.

4 : Buses and protocols (02)

Recommended Standards (RS) : RS232, RS485

Section-II

5. Introduction to PIC Microcontroller 16F877A (08)

Features, Architecture, Addressing modes, Instruction set, Assembly language programming, Introduction to software and hardware tools

6. On-chip peripherals (06)

Timers and Counters, Synchronous Serial Port , Interrupt Structure, Capture and Compare modes, PWM mode, ADC, SPI, I2C,

7. Interfacing and Programming (06)

Interfacing of devices like Keypad, Stepper motor, LED, 7-segment LED, LCD displays, DAC, Memory

8. Minimum system design (04)

Theoretical System design using microcontrollers. Microcontroller based process equipment (process parameter- Temperature) --- Interfacing of graphic LCD, Keyboard, SD card/ MMC card, USB.Software(Architecture & Flowchart/Algorithm only).

- **Term work:** Minimum 10 practicals based on following with 5 Experiments on MCS 51 and 5 experiments on Microchip PIC Microcontrollers. Use Assemblers for MCS 51 and MPLAB software for PIC Microcontrollers.

    1. Arithmetic and Logic operations
    2. Interfacing of Switches, LEDs and Buzzer.
    3. Interfacing of Matrix Keyboard
    4. Interfacing of LCD Display.
    5. Interfacing of DAC 0808 and generation of various waveforms.
    6. Interfacing of ADC 0809
    7. Use of Timer for generation of time delays
    8. Use of Timer as counter.
    9. Interfacing of Serial RTC
    10. Interfacing of Stepper motor.
    11. Speed control of DC Motor.
    12. Use of ADC of PIC Microcontrollers.
    13. Use of Interrupts for any Application.
    14. Serial communication.

- **Books Referred**

    1. 8051 and Embedded C Programming', 2nd edition, Mazidi , Mazidi, Pearson education
    2. 8051 Microcontroller Architecture, Programming and Application', 3rd edition, Kenneth Ayala, Penram
    3. Designs with PIC Microcontrollers ,John B. Peatman, Pearson Education Asia LPE
    4. Datasheets of Microchip PIC family of Microcontrollers
    5. Microcontrollers, 1st edition, Ajay Deshmukh, Tata McGRAW HILL
    6. AVR & PIC and Embedded System', 1st edition, Bernett & Cox, Pearson
    7. Intel 8051 manual
    8. Microchip Manual for PIC microcontrollers
    9. Serial Port complete, Jan Axelson, Peneram

T.E. (Electronics)-II
Industrial Electronics

Lecture : 4 Hours / Week
Practical: 2 Hours / Week

Theory : 100 Marks
Term Work : 25 Marks
Oral : 25 Marks

Section -I

1. Silicon Controlled Rectifier (10)

V-I Characteristics, dynamic characteristics, gate characteristics,ratigs dv/dt,di/dt. Over voltage and over current protection circuit. Heat transfer process, steady state and transient thermal impedance. Heat sink calculations, selection of SCR,RFI suppression. Firing ckts for SCR- R,RC,UJT,PUT,SUS, SBS and digital firing circuit with optical isolation.
Commutation circuit for SCR. Calculation of snubber network.

2. 1- PH Controlled Rectifier (7)

Half wave and full wave controlled rectifiers with R, R-L as load with and without freewheeling diode. Effect of source inductance on performance of controlled rectifier Half controlled and fully controlled bridge rectifiers with R,
R-L as a load, with and without freewheeling diode.(Numericals are expected).

3. DIAC & TRIAC (3)

Construction and characteristics of triac. Construction and characteristics of Diac. Firing circuit of triac. A.C. power control using triac, triac as a static switch, light dimmer, fan speed regulator. AC power flasher using triac. .

4. GTO, MOSFET, IGBT (3)

Construction, working, characteristics, rating and applications of GTO, MOSFET, and IGBT.

Section-II

5. Photoelectric devices and applications (6)

Law of photoelectric emission constant characteristics and spectral sensitivity of devices like LDR , photo diode, photo transistor, LED, LASCR, photo Darlington amplifier ,use of modulated light, photo couplers, photo voltaic cell.
Opto couplers, opto isolators, applications in Industry. Burglar alarm, batch counter, remote control.

6. Industrial Process Control Equipments (6)

Temperature controller analog and digital, PID controller, Temperature sensor and signal conditioning network. Data acquisition system, Multichannel process indicator.

7. Industrial circuits and systems (10)

A.C. voltage stabilizer (Relay and servo type), Constant voltage transformers (C.V.T.), U.P.S off line and on line. SMPS (isolated & non isolated), single phase preventer, Solid state voltage stabilizer(relay based and triac based). Programmable logic controller (PLC) basic concept, Ladder diagram Case study of Liquid level controller.

- **Term work:** Term work consists of minimum Ten practicals from below list :

1. VI characteristics of SCR.
2. R, RC,UJT triggering circuits.
3. Half/Full wave controlled rectifier using SCR
4. VI Characteristics of MOSFET/IGBT
5. Triac as a light dimmer.
6. Over voltage protection and over current protection..
7. Opto coupler characteristics.
8. Characteristics of photo transistor and its applications.
9. LDR characteristics, batch counter.
10. Induction heating.
11. Liquid level controller.
12. Single-phase preventer.
13. Study of A.C. servo stabilizer and UPS.
14. Simulation of 2 to 3 experiment on MATLAB/PIS PICE.

- **Books Referred**

1. Industrial and Power Electronics, G.K.Mittal, Dr. Manisha Gupta, Khanna Publications, 9th edition
2. GEC SCR Manual. Prentice Hall inc. 6th edition
3. Power Electronics , P.C.Sen., Tata Mcgra-hill
4. Power Electronic, M.H. Rashid. Prentice Hall 2nd edition
5. Power Electronics, Ned Mohan, Tore M. Undeland, William P. Robbims
6. Integrated circuits and Semiconductor devices, Deboo/Burrous, McGraw Hill Book Company, 2nd edition.
7. Industrial Control Electronics (Application and Design), Jacab, PHI
8. Process control Instrumentation Technology, Curtis Johnson, PHI

T.E. (Electronics) Part II
VLSI DESIGN

Theory : 4 Hours / Week — Theory : 100 Marks
Practical : 2 Hours / Week — Term Work : 25 Marks

Section I

1. CMOS Logic, Single channel MOS inverter, CMOS inverters- DC Characteristics **(8)** Transmission gates , Characteristics of Digital circuits (Power dissipation, Noise margin , Fan in , Fan out) , Delays and loading consideration.

2. VHDL : Introduction , Design flow, Features & capabilities of VHDL, entity, **(10)** architecture, configuration, library, package, data types, operators, Multi valued logic, resolution function, transport and inertial delays, concurrent signal assignment, signal driver, Process statement, wait statement, sequential statements, signal assignment within sequential construct, signal & variable, subprograms, generate statement, generics, operator overloading , text I/O, testbenches.

3. VHDL modeling of combinational circuits such as decoder, encoder, tri state buffer, **(6)** multiplexer , parity checker, parity generator, comparator, adder , substractor, multiplier , barrel shifter, DRAM , SDRAM , VHDL modeling of RAM , ROM. and testing.

Section II

4. Review of FSM design , VHDL modeling of counters, shift registers, LFSRs , **(7)** Melay and Moore machines, Impediments to synchronous design : Clock skew, clock jitter , gating the clock , asynchronous inputs, meta stability and synchronization failure.

5. Programmable logic devices : Xilinx 9500 series CPLD architecture , Xilinx Spartan **(3)** 4000 FPGA architecture.

6. Synthesis : Register transfer level description, constraints , attributes, VHDL synthesis **(8)** High level design flow : RTL simulation, synthesis , gate level verification , Place and route, Post layout timing simulation, VLSI design flow with reference to any EDA tool such as Xilinx web pack or Actel Libero.

7. Testing of Logic circuits : Fault model , path sensitizing, random tests, design for **(4)** testability, built in self test, boundary scan test.

- **Term work:** Term work consists of minimum Ten experiments based on followin designs. Test the designs using VHDL test bench.

  Simulation , Synthesis and Implementation of :

  1. Combinational logic: Decoder, priority encoder, comparator, adder, multiplier, barrel Shifter.
  2. Sequential logic: Counters with sync. / Async. Reset signal, cascading of Counters, universal shift registers, Melay & Moore state machines
  3. ROM, Dual port RAM, Single port RAM

  4. A mini-project to implement one of the processor peripherals in FPGA and CPLD.

- **Books Referred**

1. Digital Design, principles and practices, John F Wakerly, PHI
2. Fundamentals of Digital Logic with VHDL design, Stephan Brown and Z Vranesic , TMH
3. Digital systems design using VHDL, Charles H Roath ,PWS Publishing
4. VHDL,Douglas Perry , TMH
5. An Introduction to VHDL from Synthesis to simulation , Sudhakar Yalamanchili
6. The Designer's guide to VHDL, Peter J. Ashenden, Morgan Kaufmann Publishers

T.E. (Electronics) Part –II
Mini Hardware Project

Practical : 2 Hours / Week Term Work : 25 marks

- Mini project should consist of Design, pre-testing of main blocks in the circuit on breadboard, PCB making and testing of final assembly.

- **The total work should include**

1) Collection of appropriate data for main components in the project.
2) Design of circuit including analog part, digital part and suitable power supply.
3) Testing of main circuit blocks on breadboard.
4) Design of PCB layout for above designed circuit
5) Fabrication of PCB & assembly of circuit on PCB.
6) Testing and result analysis of the circuit
7) Suitable cabinet design for the circuit

- **Guidelines for project selection-**

1) Project must consist of at least three and more ICs.
2) Use of microcontrollers is encouraged.
3) Implementation of concepts from subjects studied is encouraged.

- **Note:**

1) A mini project group size should not exceed three students
2) Student should deliver a seminar on mini project
3) Each group must submit a project report capturing all the aspects of the project - circuit diagram, circuit description, PCB Layout, testing , applications, limitations and scope, IC Data sheets etc.